THE SELECTION OF AN ANAESTHETIC.

An essay based on the experience of 2000 administrations at the Northern Hospital, Liverpool.

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INDEX.

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Since the year 1897, when the annual meeting of the British Medical Association at Montreal was the scene of a long and interesting debate on the subject of Anaesthetics by the leading British and American authorities, the question of anaesthetics has continued to be keenly discussed on both sides of the Atlantic.

Naturally, on my appointment to the post of anaethetist at the Northern Hospital, Liverpool - with every anaesthetic at my disposal, with patients whose ages varied from a few days to three score and ten years, anaethetised for almost every operation in the wide range of surgery - I determined to devote all my energies to this most important & fascinating subject.

The object of the anaethetist should not only be to abolish sensation during operative interference, but rather to produce a degree of anaethesia, with a minimum of risk to the patient, a maximum of comfort to the surgeon and a sense of security to himself. To secure this much desired end we must at once exclude all idea of any universal anaesthetic or any routine method of administration and in the appended thesis based on a clinical experience of over 2000 administrations,

I shall endeavour to determine the suitability of different anaesthetics for various patients under surgical operations.

The following anaesthetics were administered:-

I. Chloroform	831	administrations
II. Ether	786	"
III. Nitrous Oxide Gas	82	"
IV. Ether & chloroform	71	"
V. Alcohol, chloroform & ether..(A.C.E)...	68	"
VI. Nitrous oxide gas and ether.....	62	"
VII. Chloroform and ether	43	"
VIII. Nitrous oxide gas, ether & chloroform	9	"
IX. Ether and oxygen	6	"
X. Cocaine	63	"
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Having given the above tabulated statement of the different anaesthetics employed, I now proceed to describe the various methods of administration adopted, because each particular method has a far reaching effect on the safety and suitability of the drug.

The Anaesthetics.

The Chloroform used is got direct from Duncan and Flockhart, Edinburgh; it is the pure variety with specific gravity of 1.497 and prepared entirely from British ethylic alcohol.

The ether is supplied by Clay and Abraham, Liverpool, it is the Aether Purus of the British Pharmacopoeia free from water and alcohol with a specific gravity of .723.

A C E. The mixture used is that of Martindale, prepared by the hospital dispenser in small quantities so that it is always fresh when required for use.

1 part	Alcohol	sp. gr. .795
2 parts	Chloroform	" 1.497
3 "	Ether	" .720

Nitrous oxide gas. is specially prepared by Clay and Abraham, Liverpool, and stored in iron cylinders capable of containing 50 gallons. The tap is so constructed that the tube from the gas inhaler can be readily attached to it.

Method I. Towel folded up as a cone.

Method II. Towel folded up lengthwise.

To commence with chloroform - the first on the list - I used an ordinary towel in the large majority of cases. The towel was folded up as a cone by means of a safety-pin with a space at the apex large enough to admit three fingers, thus allowing a free admixture of air throughout the administration and later on by sense of touch feel the respiration. Another method is to fold the towel lengthways with a breadth of six inches, the anaethetist supporting it under the angles of the patient's jaw. This latter method I used chiefly and I think it possesses the following advantages:-

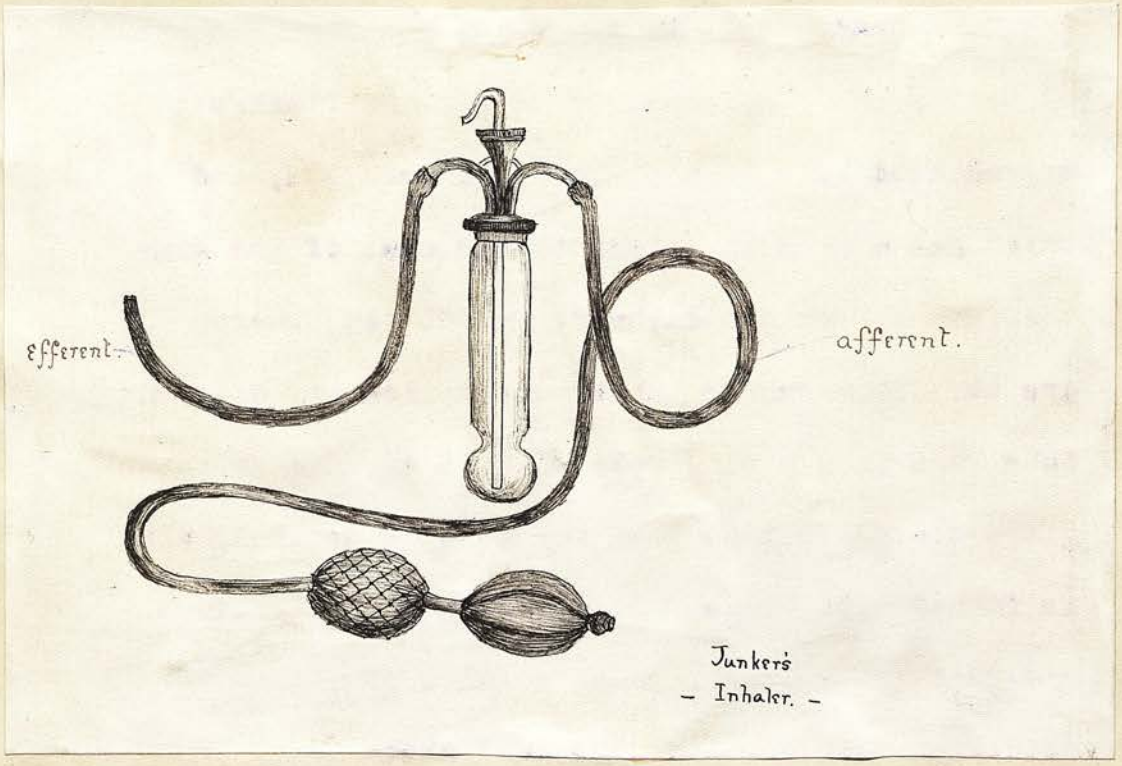
(a) The chloroformist has full view of patient's face throughout the administration.

(b) By approximating the sides of the towel he can regulate the dilution of the vapor in the "well of chloroform and air."

(c) By keeping his fingers well under the angle of the jaw, he keeps it well forward and greatly reduces any risk of tongue falling back.

To replenish the chloroform, it is necessary to place the towel on the patient's chest and then apply the chloroform, because both hands are engaged in holding the towel; this can hardly be

Method. III. Skinner's Mask.



Junker's
– Inhaler. –

called a disadvantage for, though it may be inconvenient, it always ensures a supply of free air to the patient.

II. Skinner's Mask, consisting of wire net-work, which is covered with a piece of flannel or lint; it has a small handle which may be held at the chin or between the eyes. Personally I prefer to hold the handle at the chin and let the mask remain at an acute angle with the face; by so doing a free current of air is promoted over the patient's face and a full view of lips and nose can be obtained throughout the administration. To further prevent any concentration of the chloroform vapor, I usually cut out a quadrant of lint.

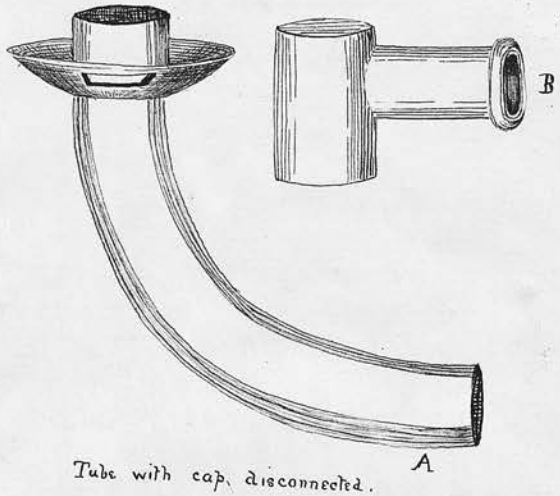
III. Junker's Inhaler, consists of a glass flask with a graduated bulb to contain the chloroform, and which has a hook to attach to the coat of the anathetist. From a mill-headed metal top, there are two india-rubber tubes, one called the afferent tube runs from a net enclosed ball syringe into the glass flask, so that when the ball is pressed, air is forced along this tube, through the chloroform, and is carried out by an efferent tube, which is usually connected with some face piece or other

Method IV. Junker's Inhaler. efferent tube in patients left nostril

depending upon what variety of Junker you employ, but in all my administrations I dispensed with anything approaching a face piece, simply putting the tube in the nostril. It is easily manipulated and anaesthesia in certain operations can be maintained by closely watching respiration and forcing air along the afferent tube so timed as to reach the efferent tube at the beginning of inspiration. When the patient is sufficiently under the influence of the drug, the bellows need not be used, as with each inspiration, patient will take enough chloroform vapor to maintain anaesthesia; of course the tube should be removed from time to time according to the requirements of the patient. As regards the length of the afferent and efferent tubes I think there is no definite limit: our afferent tube is 24 inches long, and the efferent tube varies between 18 and 36 inches.

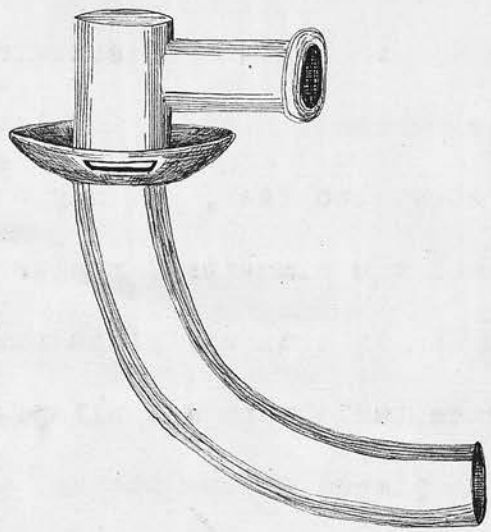
IV. Tracheotomy tube, shield and india rubber tubing, as suggested by Professor Annandale. For account of this apparatus, I quote the Professor's own description, published in the "Lancet" Nov.6/97, page 1184: "An ordinary full sized silver tracheotomy tube having its upper end extended for about half

Fig 1.



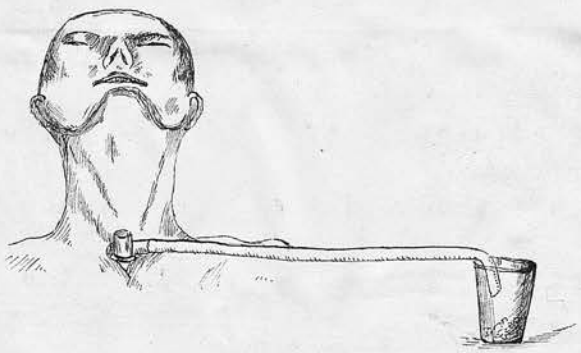
Tube with cap disconnected.

Fig 2



Tube with cap in position.

Fig 3.



Cap connected with india rubber tube dipping into vessel containing wool and anæsthetic.

2.

an inch beyond the shield. A silver cap having a short tube of the same metal projecting at right angles from it and to which one end of an india-rubber tube is connected. In fig.2, is shown the cap fitted on to the tracheotomy tube. The cap fits easily and can be at once lifted off the tracheotomy tube and also turned round so as to allow the attached india-rubber tube to project on either side, whichever may be found most convenient for the administration of the anaesthetic. 3. A portion of india rubber tubing. The length of this should be about two feet; it may be shorter or even longer and the diameter I prefer is about half an inch. 4. An ordinary glass tumbler, or other similar receptacle with a small piece of lint or absorbent wool placed at the bottom, upon which chloroform is from time to time sprinkled." In fig. 3, the whole apparatus is shown in position.

Professor Annandale claims the following advantages for the apparatus, and although my experience has been limited to two cases, consequent upon the variety of operative proceedure requiring such a method, I gladly reiterate the subjoined advantages, which I quote from the same article in the "Lancet".

(1) It is simple and at the same time effectual.

(2) The cap being moveable, can, if necessary, at once be disconnected from the tracheotomy tube so as to allow mucus or other matter to be more easily expelled from the air passages. This mobility also allows the cap and connected india-rubber tube to be turned round to either side.

(3) It allows the anaesthetic to be administered at some distance from the patient and so does not interfere with the operative procedure.

(4) The anaesthetic when inhaled through the long tube in not likely to be so irritating to the air passages as when it is more directly inhaled through the tracheotomy tube itself.

ETHER.

All administrations of ether were made by the closed method by means of Rumboll-Birch Gas & Ether Inhaler, a printed description of which I enclose. It is a much improved "Clover's Portable Inhaler" with the advantages that you can readily combine gas with your ether, or give either gas or ether separately.

THE RUMBOLL-BIRCH GAS AND ETHER INHALER.

— PATENTED. —

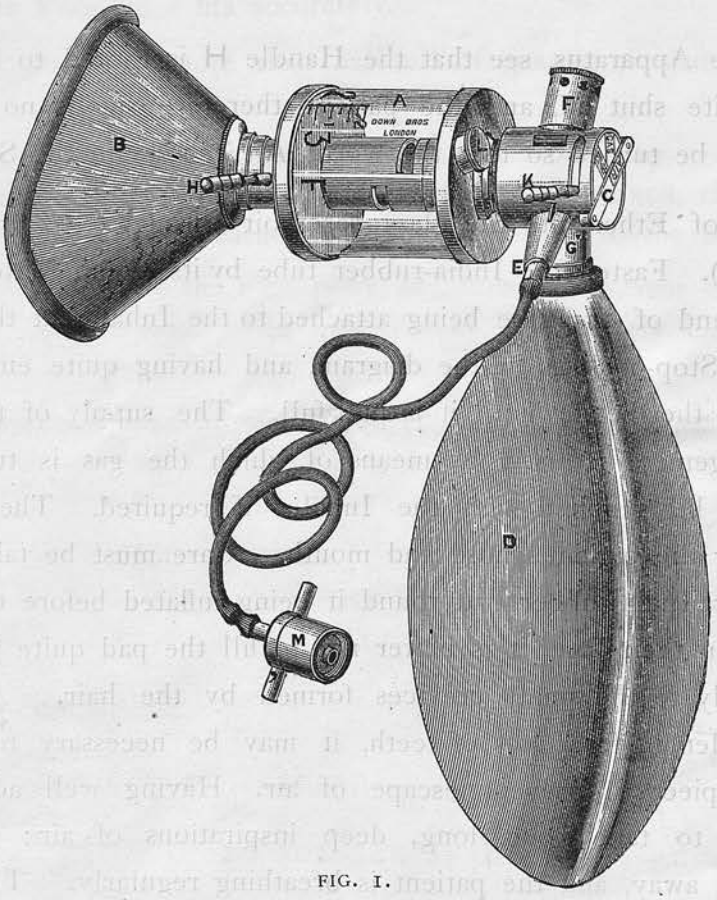


FIG. 1.

FOR some time the impression has been growing upon the Medical Profession that Ether is the safest of all anæsthetics, but the nauseous odour and the difficulties of administration have prevented its universal adoption. The RUMBOLL-BIRCH GAS AND ETHER INHALER has been designed to overcome these difficulties, and the Inventors claim to have produced an Instrument in which Ether can be given with perfect safety and with scientific precision, and by the combination of gas with the Ether the unpleasant odour is overcome, and the subsequent struggling avoided.

THE APPARATUS CONSISTS OF—

A. Glass body containing the Ether.

B. Face-piece.

C. Three-way Stopcock, which allows the patient to breathe air, gas or Ether at the operator's will.

D. India-rubber Bag.

E. An India-rubber Tube for conveying gas from the bottle to the Bag **D**.

F. Expiratory Valve for gas.

G. An Inspiratory Valve for gas is placed inside the Tube **G'**, on which the Bag **D** fits. This valve prevents the patient breathing back into the gas bag when inhaling N_2O.

DIRECTIONS FOR USE.

Before using the Apparatus, see that the Handle H is turned to Figure O, so that the Ether chamber is quite shut off, and the patient therefore smells no trace of Ether. The Handle K should also be turned so that the word 'Air' shows in the Slot C.

Pour an ounce of Ether into the glass reservoir through the opening L. (this quantity lasts about 30 minutes). Fasten the India-rubber tube by its Union M to a bottle of Laughing Gas (N_2O), the other end of the tube being attached to the Inhaler at the point E. Then put the Bag D on to the Stop-cock as in the diagram, and having quite emptied it of air, slowly turn the gas on from the bottle until it is half-full. The supply of the gas is more easily regulated, if an arrangement is used by means of which the gas is turned on by the foot. This arrangement can be supplied with the Inhaler if required. The Face-piece B is now applied, so as to cover the patient's nose and mouth. Care must be taken to see that it fits accurately, the hollow India-rubber pad round it being inflated before use. In the case of men with much hair on their face, it is better not to fill the pad quite full of air, as it then adapts itself more easily to the small crevices formed by the hair. And in some patients whose cheeks have fallen in from loss of teeth, it may be necessary to put a small folded towel round the Face-piece to prevent escape of air. Having well adjusted the Face-piece, encourage the patient to take good long, deep inspirations of air; watch until the first nervousness has passed away, and the patient is breathing regularly. Then at the end of a deep inspiration, turn on the gas by turning the Handle K, so that the word Gas is shown in the Slot C. Keep the gas gently turned on from the bottle, so that the bag remains about half-full all the time. The patient now inspires gas out of the bag, and expires through the Valve F, thus preventing the gas being inhaled twice. It is difficult to say exactly how much gas a patient requires before turning on the Ether. The administrator soon learns the quantity from experience, the rule, however, is to give plenty.

Allow the patient to inhale the gas until he becomes insensible to the smell of Ether, then turn the Handle H from left to right, until it points to Figure 1. The patient is now breathing one part of Ether and three of gas. Then rapidly push on the Handle H to Figures 2 and 3, keeping the gas going simultaneously, until the patient is completely insensible. Some patients turn rather a blue colour, but this need cause no uneasiness. When quite insensible, turn the Handle K so that the word Ether is shown in the Slot C. This shuts off the gas, and allows the patient to breathe in and out of the Bag D. The patient is now breathing the amount of air in the Bag D and Ether. The India-rubber tube is now removed, and Etherization continued, the patient breathing in and out of the Bag D.

SUMMARY.

1. See that the Face-piece fits accurately.

2. Do not fill your bag more than half-full of gas, to prevent too sudden a rush of gas to the patient.

3. Give plenty of gas—nitrous oxide causes insensibility by cutting off the supply of oxygen from the brain: and even in the event of giving too much, the patient immediately comes round on being allowed to breathe air, and so restoring to the brain its oxygen.

4. On no account remove the Face-piece, or allow the patient to have a breath of air until he is completely unconscious. The blue colour immediately disappears on taking one or two breaths of air.

5. When complete insensibility is produced, the Handle H may be turned to about 1½ or 2, and Etherization continued at that strength, the Face-piece being occasionally removed from the face to give the patient a breath of air.

N.B.—TO KEEP THE APPARATUS IN WORKING ORDER.

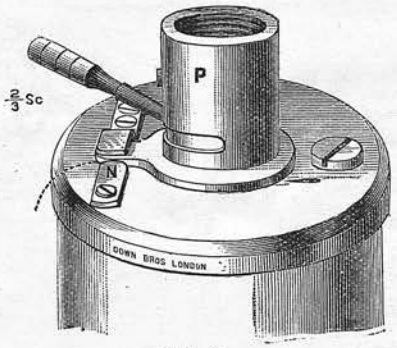


FIG 2.

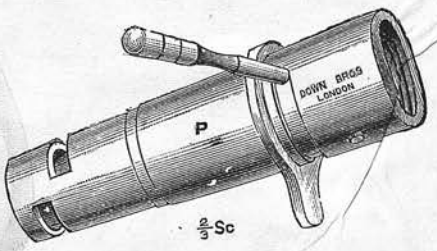


FIG 3.

The glass Ether chamber has a central tube running through it, with two slots cut in it, which are opened or shut as the Ether tap is turned on or off. To keep these openings absolutely Ether-tight when turned off, it is found necessary to occasionally lubricate with vaseline.

To do this, open the Latch N (Figure 2) and withdraw the Tube P, as shown in Figure 3.

The Expiratory Valve F is provided with a cap, which should be occasionally removed and the valve inspected.

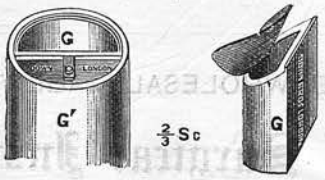


FIG 4.

The Inspiratory Valve G, which is placed inside the Tube G', is also so made that it can be removed for inspection, as shown above (Fig. 4).

THE ADVANTAGES OF THE INHALER.

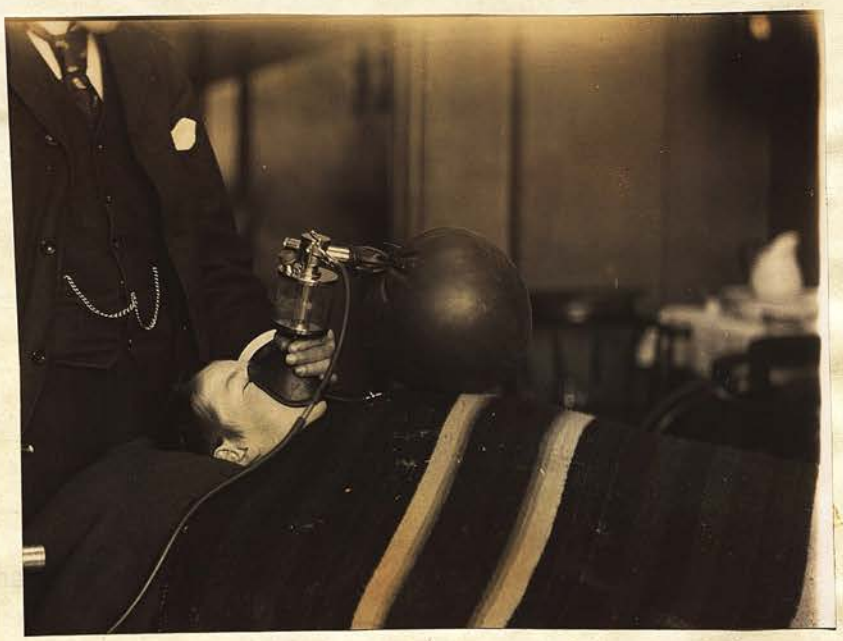
1. Its safety, anæsthesia being produced in a shorter period than with any other Inhaler, and struggling entirely prevented, the faintest respiration being clearly indicated in the chambers.

2. Its great portability. No cumbersome apparatus to carry about, simply a small bottle of gas and the Inhaler. It is the only really portable "Gas," "Gas and Ether," or "Ether" Inhaler in the market.

3. The body being of glass, the quantity of Ether used can be seen, the last drop used up and waste avoided.

4. It is so accurately made, that the patient smells no trace of Ether.

5. It can be used as a simple Ether Inhaler without gas.



Ether. Bag full at end of expiration.

For the administration of ether my routine is:-

(1) Pour 1oz of pure ether into the glass resevoir "A"; see that the indicator "H" is opposite "O"; thus the ether chamber is entirely shut off and patient cannot smell any of the ether.

(2) Select an accurate fitting face piece "B" (There are several sizes according as patient is a small child or adult. The pad consists of a cone made of vulcanite or celluloid or leather with a rubber tube going around the base which is inflated by means of a tap)

(3) We have now the face piece "B", Glass Resevoir "A" and 3 way stop cock "C" all fixed in position, so accurately apply face piece over mouth and nose of patient.

(4) Having applied the Inhaler, encourage your patient to take slow deep breaths, assuring him that it is only air he is breathing,& then attach Bag "D" to Stop cock "G".
It is advisable at this stage to firmly press the face piece during expiration and somewhat relax the pressure during inspiration, so that with next expiration the bag will be filled with patient's breath.

(5) The apparatus is now complete and after the

patient has breathed backwards and forwards for at least half-a-minute, the indicator "H" is turned on 1/4 and kept there for half-a-minute to allow the larynx to become accustomed to the irrating effects of the vapor; if this precaution is not adopted, struggling, swallowing, coughing or even holding of the breath may ensue. The bag is now emptied and filled at each inspiration and expiration, and the expansion and contraction of the bag is now your guide as to the character of the breathing; if the patient holds his breath, the bag remains stationery; if the respiration is rapid, short or shallow, the result will be seen at once in the bag. The great point is now that the bag is filled with air and you have commenced your ether not to allow the face piece to be removed until patient is under.

(6) At the termination of half-a-minute's administration of ether with the indicator at 1/4 the patient has generally become accustomed to the ether and so now you gradually rotate the indicator "H" round during the next half-minute to 1° marked on the glass resevoir.

This period is usually one of excitement, different individuals displaying different symptoms according to their temperament. After temporary excitement, the face generally flushes, perhaps he begins to perspire freely (this is specially seen in alcoholics) he may get quite rigid, fixing his thoracic muscles, grinding his teeth, yelling etc.

(7) During the next minute continue to gradually rotate indicator "H" to number 2 on glass cylinder; by this time the respirations if previously irregular or wavy, now become rhythmical, pupils begin to contract and patient becomes stupified. There is nothing gained in prolonging the period of struggling so now rapidly but evenly turn indicator on to 3 and at the end of 5 minutes, in the large majority of cases, your patient is under; seldom is it necessary to turn indicator to "F" to secure this, though in young, robust men it is sometimes of advantage to go to the full at once.

(8) By this time the patient's face and ears are cyanosed, pupils contracted, conjunctiva insensitive. Remove face piece for one

breath; then re-apply, and after one or two breaths, the operation may proceed. It is not necessary to keep the indicator at 3° or 4° as the case may be, but once having established complete anaesthesia, gradually turn indicator back to 1 or $1\frac{1}{2}$, swinging it either way as the condition of the patient requires.

(9) During the remainder of the administration, lift the face piece about four times per minute or oftener if patient gets very cyanosed. Once well under it requires little ether to maintain the anaesthetic stage, provided a limited amount of air only is allowed to enter.

(10) Throughout administration keep the face dry with a towel, occasionally rub lips, wipe away any mucus that may be around the mouth, and as far as possible see that patient is well wrapped up with blankets, as is convenient to the operator.

(11) If, during operation, more ether is required, the indicator is turned to "0" and ether poured into the glass resevoir "A".

NITROUS OXIDE GAS.

For all administrations of gas, the Romboll-Birch apparatus was used, that is, the same as the Gas & Ether apparatus described on page 14, excepting that the glass graduated cylinder for the ether not being required is omitted and so the inhaler consists of a face piece as in ether "B"; (2) three way stopcock "C" which allows the patient to breath air, gas or ether, according to position of slot; (3) an india-rubber bag "D"; (4) an india-rubber tube fixed by a union "M" to a cylinder of Nitrous Oxide Gas. When complete the slot should be turned so as to show the word "AIR".

The following method I adopt in all my administrations:-

(1) Place the face piece accurately over the mouth and nose so as to exclude all air; in men with large beards it is a good precaution to apply some vaseline to the face and not inflate the rubber ring too tightly.

(2) Ask your patient to hold up his right hand and impress upon him the importance of breathing quietly and deeply, and let him breathe several times into the bag.

(3) When it is anything like regular, turn slot

Administration of Ether combined with nitrous oxide gas or oxygen. –

Contents of cylinder now turned off and administration continued with Ether only. –

so as to show the word "GAS".

(4) Throughout, keep the bag about half inflated with gas from the cylinder.

(5) The patient inspires gas from the bag and expires through the valve "F".

(6) When patient assumes a blue colour and his right hand which he has been holding up, falls to the side, then unconsciousness is complete, and operation may be proceeded with.

NITROUS OXIDE FOLLOWED BY ETHER.

Method of administration. The Rumboll-Birch gas and ether inhaler used, a printed description of which I enclose. When the apparatus is adjusted the word "Air" should be showing in slot "C", while the india-rubber tube with its cylinder "M" is attached to a cylinder of Nitrous Oxide gas, which is turned on or off by an assistant, (1) when the face is applied firmly, the patient is asked to hold up his right hand and after breathing a few times "air" turn handle of slot until the word "gas" shows in slot.

(2) When patient has been rendered unconscious with "gas", or has inhaled sufficient to make him insensible to ether, turn on the ether, pushing the indicator to 1°.

(3) He is now breathing one part ether, three parts gas.

(4) After about half a minute, turn the handle of slot to show word "ether" and continue your administration as described under ether, on page 15.

Preparation of Patients.

As the Northern Hospital is very largely an accident hospital, the patients who come under the anaesthetist so often require immediate treatment that any attempt at preparation for operation or anaesthetic, is quite out of the question.

For patients residing in hospital and about to undergo an operation, the following routine is observed in the preparation.

The night previous some purgative is given, suitable in all cases to the condition of the patient, next morning an enema is administered. At 7 a.m., he gets an ordinary breakfast unless some condition of his alimentary system contraindicates such a course. At 11 a.m. he gets some bovril, Brand's essence or beef tea, after which he gets nothing more until the operation at 2 p.m. Half an hour before going to the theatre, if patient is feeble or nervous, a little whisky or brandy is given, but this is seldom required. A careful examination of the urine is made on the morning

of the operation and in most cases a stethoscopic examination of chest made in the wards.

On arriving at the theatre a careful examination is made of the mouth for false or loose teeth; also the condition of the uvula and the nasal passages are not forgotten, condition of pupils noted, everything tight around neck or waist removed, and if patient should happen to be a child or female with a delicate skin, some vasaline is smeared on the cheeks to prevent any irritation by the anaesthetic.

Having described in a general way, the various methods employed in giving anaesthetics and the usual preparation of patients for such administration, I next pass on to a critical study of the influence of different anaesthetics in the various morbid conditions met with. As anaesthetist I had to a great extent a free hand in the large majority of cases. However in certain critical cases, or important operations, the operating surgeon decided on the anaesthetic, consequently different anaesthetics may have been given to patients suffering from the same disease, and on this account - from close observations made at the time - I am able to give my opinion as to the relative efficiency of the respective anaesthetics.

The most convenient way to get a comprehensive view of this wide subject is I think to take different systems, as I was taught in my clinical medicine classes. The most important one to the Anaesthetist, whatever be his predilection is undoubtedly the respiratory system; therefore I propose to deal with this first:-

I have arranged a condensed list of the anaesthetics given in different respiratory troubles below:-

RESPIRATORY.

	Chloroform.	Ether.	A.C.E.	Gas.	Total.
Bronchitis	71	22	2	8	103
Phthisis	46	28	8		82
Emphysema	26	2	14		42
Pleurisy	12	2			14
Pneumonia	6				6
Asthma	7				7
Pneumothorax	7				7
Croup	5				5
Diptheria	2				2
Whooping Cough	2				2
Empyema	7	Cocaine 3.			10
Sarcoma of Lung		1			1
					281.

In dealing with patients suffering from respiratory diseases, my experience has been limited to 281 patients and 5 anaesthetics, viz., chloroform, ether, A.C.E., nitrous oxide and cocaine.

To commence with the commonest respiratory affection, Bronchitis, I have notes of 103 administrations on patients whose ages varied from 13 1/2 years to 72 years, average 35.5 years.

(a) Chloroform, was given in 71 cases by means of a towel or Skinner's mask. There were slight respiratory embarrassments with the first few inhalations. In a few cases coughing was a prominent symptom and expectoration was increased, but once under the influence of the drug, there was no further trouble, and an examination of the chest the same evening and next day revealed no increase of bronchitis in the acute cases or aggravation of the trouble in the chronic variety.

(b) Ether, was the anaesthetic in 22 cases given by means of a Rumboll-Birch inhaler. The reason ether was selected in the presence of the bronchial catarrh was that nine patients were in a very collapsed condition from accidents, four from strangulated hernia, and for the remaining nine there was no reason beyond the express wish of

the operating surgeon. In almost all the cases the early part of the administration was attended with difficulty, although the greatest care was exercised in allowing at the outset only a very diluted quantity of ether to reach the larynx, respiration increased, there was profuse discharge of saliva, coughing, struggling more or less violent, while early cyanosis was present in 8 cases. After the administration there was abundant discharge of watery secretions, either vomited or expectorated for several hours, in some cases persistent cough, in the older patients considerable collapse, auscultation revealed râles increased all over the chest.

(c) A. C. E. was selected for two patients, one a lad aged 11 with a compound depressed fracture of the skull, the other a man aged 36 with an axillary abscess but suffering from a dilated heart. The boy was suffering from an acute attack of bronchitis, but took the anaesthetic well and everything passed off favourably. In the case of the adult who was also alcoholic, there was rather much struggling to please the anaesthetist and very much more of the A.C.E. mixture was required than if chloroform alone

had been administered.

(d) Nitrous Oxide Gas was given with the Rumboll-Birch inhaler eight times for minor surgical operations, and although in two of the cases the bronchitis was severe, the administration or after effects did not call for any particular notice.

PHTHISIS.

Altogether I had occasion to administer an anaesthetic 82 times to phthisical patients, viz., chloroform 46, ether 28, A.C.E. 8, and can only record (with one exception referred to below) the happiest results. Strange to say in the whole of the patients, we had the advantage of special preparation in hospital for some time before operation, and in no single case did vomiting occur afterwards, which I think must be a convincing argument that a proper attention to diet and regulation of the bowels, is the very best preventative for one of the most serious after-effects of anaesthetics, viz., vomiting.

(a) Chloroform was given both with towel and Skinner's mask, and although several of the operations were on the rectum, consequently requiring the deepest degree of anaesthesia, in no case was the slightest cause for apprehension,

a few of the cases were in the last stages of phthisis, and in these cases the anaesthetic was exhibited slowly on a towel under the chin.

(b) Ether was given in 28 cases, in the majority of which the phthisis was in its first stages, though a few were cases of old standing, and these took ether remarkably well. The only after-effect to note was free expectoration.

(c) A.C.E. was selected for 8 administrations the reason for the choice in all cases was the presence of some cardiac lesion and in three patients there was marked compensatory emphysema. In all cases Skinner's mask was employed and the time taken to secure anaesthesia rather prolonged, varying from 8 to 14 minutes. In all the patients struggling was quite absent, in one or two evident alcoholic subjects there was some exercise of the vocal organs.

In the case of one patient, I had an opportunity of giving both chloroform and ether, and as this was the case which caused me some anxiety, I attach some details of the administrations.

T.C., aet 36, an undersized man, admitted on a Tuesday complaining of intense pain in the abdomen; said he had suffered more or less from

attacks of colic for the past nine months. Examination of chest revealed both apices effected, especially the right; sputum teeming with tubercle bacilli. Abdomen was always rigid, palpation elicited some resistance immediately below the umbilicus, but owing to pain nothing could be satisfactorily determined; he looked very emaciated and said he was loosing weight at the rate of 3lbs per week.

On Wednesday (the day after his admission) it was decided to give chloroform and examine the abdomen. 3 1/2 drams was used on a Skinner's mask, patient deeply under in four minutes and kept in that state for 8 minutes - total time 12 minutes, a return to consciousness in 5 minutes, no sickness, said he felt all right.

On Thursday chloroform 5 drams again given for the purpose of making a cystoscopic examination of the bladder - total time 10 minutes. Patient regained consciousness in 4 minutes without feeling any ill-effects of the anaesthetic.

On Friday, an exploratory laparotomy was decided on, and after consultation between the honorary physicians and surgeons, ether was selected. Owing to the severity of his pain, morphia 1/4

grain was given hypodermically at 1 p.m. Anaesthetic commenced at 2 p.m., concluded at 3-3 p.m. - total time 63 minutes, quantity of ether used 3 oz 1 1/2 drams. Patient was found to be suffering from tubercular peritonitis, dense adhesions, and a mass of enlarged infiltrated retro-peritoneal glands. Patient was carried from the theatre to his ward, but no sooner was he put on the bed than his pupils dilated, respiration became slow, shallow and sighing, face ghastly white, forehead bathed in perspiration, pulse scarcely perceptible at wrist. Hypodermic injection of strychnine m.8, with atropin minims 2, was immediately given. Liquor Ammonia fort. applied to the nostrils, hot bottles completely surrounded him, and the end of the bed was raised about 2 feet. Thirty-five minutes after the operation he showed signs of returning consciousness, but quite an hour elapsed before he spoke. He remained in a very collapsed condition for about thirty hours, but under constant treatment he rallied and made excellent progress for a few months, eventually succumbing to phthisis pulmonalis. For some days after the operation, he expectorated very freely and was much troubled with cough.

In this instructive case the patient was anaesthesised on three successive days, the first two days chloroform was used, the third ether, both administrations with chloroform gave satisfaction to everyone concerned; why then was ether tried ? Well, this is a case where the anaesthetist had not a free hand. The physician who had charge of him on the medical side and the operating surgeon consulted and decided on ether on the following grounds:-

1. Pulse was weak and rather rapid.
2. Morphia 1/4 grain had been given an hour previously, and his pupils were fully contracted.
3. Patient had not been able to take nourishment properly for some time past and was a mere skeleton.
4. The operation would probably be a prolonged one.

Personally, I strongly advocated chloroform at the time on the following grounds:-

1. The weakness of the pulse might be improved by a hypodermic of strychnine, ether or some cardiac stimulant.
2. In my experience, chloroform acts much

more efficiently after morphia than ether does.

3. In abdominal operations a large amount of ether is necessary to produce the necessary relaxation of the abdominal muscles and remembering the condition of the patient's lungs, I cannot but think that chloroform would have answered every requirement and was just as safe as ether, having once produced anaesthesia with chloroform, it does not require very much more to maintain it.

Finally, I may state that patient took the ether well, during the initial stages there was no struggling, practically little coughing, he breathed regularly, kept a good colour throughout, and there was no after sickness. The reason for the collapse afterwards was probably due to the patient's general condition, the length of time of operation, and the handling of the intestines, and, perhaps, the morphia exercised some slight influence.

EMPHYSEMA.

Emphysema is a condition which always causes anxiety and I think my 42 administrations caused more worry than all my other administrations put together. Chloroform was given 26 times, ether 2, A.C.E., 14. In almost all the cases, there was either dilatation or hypertrophy of the heart, and in the majority of the cases many other complications were present, thus in 11 patients albumen was present in considerable quantity, 17 were alcoholics, one had cirrhosis of liver with great ascites, several markedly atheromatous vessels, and in nearly all was bronchitis present in a more or less chronic form. Again the age was a consideration, as only two of the patients were under 20, and 23 were over 50, the average age was 48 years.

(a) Chloroform was always given by means of a towel, with free access of air to face, never pushed, if there was the slightest attempt at atruggling the towel was immediately withdrawn. This necessited rather a long time rendering your patient unconscious, still I found it the most efficacious.

All emphysematous patients are bad subjects as a rule for anaesthetics, and in my co-

lection I had some extremely unsuitable cases, some indeed were so bad that it was a grave question whether any anaesthetic should be given and in these cases A.C.E. was selected.

(2) A.C.E. administered on a Skinners mask (with one quadrant cut out) was always used and the gradual process adopted, there was some flushing of the face, restlessness, but on the whole fairly regular respiration was maintained and having got over the initial stages, the patient can be more safely kept under the influence of A.C.E. than with Chloroform. The effects on the patients were very similar to Chloroform, but pulse rate is quickened, the color of the face becomes darker, and the lips have a tendency to become purple if the mixture is pushed during the later stages, salivation is well marked, but the after effects were much more satisfactory than with ether or chloroform.

In all the cases there was a degree of excitement, but whether this was due to the temperament of the patient or the effects of the mixture it is difficult to say.

(3) ETHER was given to two cases, one to an alcoholic man aged 52 who weighed 18 stone 10 lbs, and who was brought to hospital suffering from a dislocation

of the shoulder, his pulse was very weak and heart sounds were extremely feeble, added to this he had but recently dined, was very drunk and had been very severely handled in a street brawl, so taking everything into account ether was used, but it wasn't very successful, it required 13½ minutes before manipulative attempts could be made, the face piece had to be repeatedly withdrawn. Early cyanosis present vomiting severe, prostration great, salivation profuse. After effects were:- vomiting for about six hours, maniacal behaviour for an hour, and coughing and expectoration well marked for days afterwards, truly a dismal failure viewed from any aspect.

The other case was a woman aged 35, admitted with a very oblique fracture of femur and as an anaesthetic was essential to properly reduce and correct the fracture, chloroform or A.C.E. was suggested, but she would submit to no form of anaesthesia except ether; she was a flabby woman, heart sounds good, a history of occasional asthmatical attacks and some slight bronchitis present. By means of the Rumboll Birch Inhaler she was rendered unconscious in 6 minutes, breathing very shallow, face suffused, lips very purple, mouth full of saliva, was under the ether altogether 16 minutes and

6 drs. used. Immediately ether was withdrawn she got a hypodermic of atropin, mⁿ still there was plenty expectoration and for several days afterwards her chest had to be closely watched and treated Her temperature remained over 100° for 4 days, but when the cough disappeared it fell to normal and she had a good recovery.

PLEURISY.

Of pure and simple cases of pleurisy I have records of 14 patients with ages varying from 11 to 68. Average age 28. In these cases chloroform was the anaesthetic selected in 12 cases and ether was given in 2.

Chloroform was given gradually at first from a towel with a plentiful supply of air, in all the cases there was an increase of respiratory movements which caused some pain, so that once unconsciousness appeared it was then rapidly pushed until the requisite anaesthesia was attained.

On an analysis of the patients I find 3 at least had double pleurisy and their ages were 22, 31, & 68, years; two had effusion into the pleural cavity aged 16 and 18, the remaining seven were cases of single pleurisy, 5 on the left, 2 on the right.

Nine were emergency operations, three only having

the advantage of a special preparation, however in no case was there any after sickness, marked increase of pain or any respiratory embarrassment. The average time for each administration was 30 minutes and average quantity of chloroform used 6 drs only in two cases did the struggling cause inconvenience to the chloroformist, in both cases anaesthesia was eventually secured without any untoward result.

ETHER:- (Two cases) A girl aged 16 years, crushed foot (Syme's Amputation); on making a stethoscopic examination of chest coarse dry friction sounds distinctly heard all over left side, said she had pain and cough during past few days, but pain and shock had diverted her attention. She was very blanched evidently having lost much blood; Pulse 118, very feeble; respiration 32 rather shallow; temperature 100^{6}, and very neurotic, hence selection of ether. The rapid method of administration with Rumboll Birch employed; time taken to produce complete anaesthesia 3 minutes. The indicator never exceeded $2\frac{1}{2}$ and when anaesthesia was complete it was put back to $\frac{1}{2}$ and kept between $\frac{1}{2}$ and $\frac{1}{4}$ until completion

of operation, the inhaler had to be frequently removed throughout as cyanosis became very marked, and although fresh air revived her and abolished cyanosis it always caused a short irritating cough accompanied by profuse secretion of mucus and saliva which simply poured from mouth.

Time of anaesthesia 28 minutes, Quantity 13 drachms. After Effects. Very sick for several hours, complained of intense pain over left side, coughed unceasingly and expectorated freely, and morphia had to be continuously used to secure rest for patient. The second case was a very pronounced alcoholic dock labourer aet 36, suffering from a suppurative olecranon bursitis and cellulitis of left arm. Well marked friction was present in the right side, very slight bronchitis, heart sounds weak and irregular but no definite murmur. During the preliminary stages of anaesthesia there was much struggling and inhaler had to be withdrawn twice, took 4½ minutes to produce anaesthesia, which was maintained 3 minutes longer then withdrawn, total quantity of ether used 7 drachms.
After Effects:- Came from under influence of drug with much coughing, violent movements, very demonstrative and for 6 hours remained in a state of wild delirium requiring two able bodied porters to keep him in bed. For several days afterwards bronchitis gave a lot of trouble and he required sedatives in large doses to calm his excitement and relieve the pleuritic pain.

EMPYEMA. In no surgical affection is the skill of the anaesthetist put to a greater test than in the anaesthetisation of such cases. There is still much discussion as to the appropriate anaesthetic to select but I believe the concensus of opinion is in favour of chloroform. From my own experience, certainly limited to only 10 cases I should hesitate very much to give anything but Chloroform. In arriving at this conclusion I have been aided by the experience of my Honorary Surgeons & Physicians, for all the patients were sent to the surgical side from the medical, and in nearly all the cases the question of the anaesthetic was discussed with the result that $CHCl_3$ was unanimously selected.
In each case my plan was to ascertain as far as possible from the history of the case, from the physician in attendance and from my own examination the precise state of matters and anaesthetise accordingly. In an ordinary empyema of one pleura, with heart sounds good and general condition of patient fair, I seek a deep degree of anaesthesia by means of the towel held some distance from the patient's face, usually about 6 inches. To my mind the secret of a successful administration in such cases lies in a very gradual dosage of the Chloroform, the slightest

attempt at struggling should be met by immediate removal of the towel and on no consideration should the drug be pushed even if it should require 15 minutes to secure the desired degree of anaesthesia, and by so doing you will be certain to secure your end with satisfaction to the surgeon and least peril to your patient. In the above cases the patients were all in the dorsal position and this brings me up to speak of the position of patients in Empyema, which requires special attention. Speaking generally I think the dorsal position is best to commence with and if possible should be maintained throughout, the patient being drawn to the edge of the operating table or bed in that position, any turning or moving about of the patient is attended with risk - in some cases very grave risk, as any anaesthetist can testify who has watched the effect of turning an empyema patient from the dorsal to lateral position.

If the lateral position must be adopted by the surgeon, try if possible to keep the unaffected side uppermost; if this will not meet with the approval of the operator and he wishes the affected side uppermost, then it might be partially done closely watching the result on the patient and at

the first signal of danger to change the position at once.

In very advanced cases, as where a cavity is known to exist or patient has been coughing up pus for some time previous to operation I adopted the method of "partial anaesthesia" suggested by Surgeon Lieutenant Colonel Laurie in the British Medical Journal July 31st 1897, who advocated this method after the finding of the second Hyderabad Commission, in short I used Chloroform as an analgesic rather than an anaesthetic, thereby allowing patient to cough up any pus which might collect in the bronchus, and so prevent unnecessary respiratory embarrassment and its concomitant cyanosis.

ILLUSTRATIVE CASE.

D. J. Aet 31. marine fireman suffering from suppurating scalp wound, lymphangitis of right side of neck. Septic pneumonia of right lung with empyema, and pleurisy of left side. Patient had been an inmate of the hospital for 10 days and was exceedingly ill, his average daily condition was temperature 103, pulse 120, respiration 30, with frequent attacks of vomiting if he took any nourishment. After consultation between physicians and surgeons it was decided to give chloroform, make an incision, wash out the pleura and drain.

Condition of patient at time of operation:-
Semi-conscious, very pallid, lips colorless, pupils dilated, nasal breathing marked, tongue very furred trace of albumen in urine, pulse 104, respiration 34 temperature 102^4: Two hours before had Pulv Ipecacuanha Co. 8 grains to relieve severity of pleuritic pain.

Anaesthetic commenced at 2 hrs.50 min. with patient lying on his back.

Hour.	Minutes.	
2.	50.	Chloroform commenced, half a drachm given on a towel.
2.	51.	Half a drachm repeated, breathing wretched.

Hour.	Minutes.	
2.	53.	One drachm cautiously applied, pupils beginning to contract.
2.	55.	One drachm added, pulse at temporal artery irregular.
2.	56.	One drachm added, breathing more regular, pupils midway between contraction anddilatation, cornea insensible.
2.	56½.	Operation commenced. Fourteen ounces of fluid removed.
2.	58.	Commenced to irrigate pleura.
3.	0.	Drainage tubes (2) inserted, patient coughed slightly and showed signs of "coming to" so half a drachm was added.
3.	3.	Operation and drainage complete, patient looking very ghastly but taking deeper breaths, pulse 142.
3.	15.	Patient regained consciousness, asked for drink, commenced to cough.
3.	18.	Vomited slightly.
3.	20.	Was given a capsule of creasote, one minim. An hour afterwards felt quite comfortable, no vomiting and with the exception of a few nightly remissions he went on wonderfully well and was

eventually able to join his ship 8 weeks later. Operation lasted 13 min. Quantity 4½dr. Time taken to produce anaesthesia 6½ minutes.

Note:- Patient was in an extremely critical condition and cocaine was first suggested, finally $CHCl_3$ decided on, in this case the breathing of course was the all important thing to watch, the towel was held about 8" away from the patient and that distance was increased if he displayed the slightest restlessness, by this means the first stage was successfully reached without any struggling and with no great expenditure of $CHCl_3$. After this stage was reached the towel was held as usual around the chin and he took the anaesthetic extremely well, never giving any cause for alarm throughout. The after effects if present at all were of benefit and I think the gradual administration of $CHCl_3$ of greatest value in all respiratory cases, but especially so in empyema.

ASTHMA. In this distressing condition my experience of anesthetisation is limited alone to chloroform and though my experience is confined to six patients and seven administrations, the results have been so satisfactory both to patient and physician that I would strongly urge its employment

earlier in treatment rather than as is too often the case as a dernier resort when perhaps a combination of dangerous drugs in dangerous doses has already been tried and so a greater risk in chloroformisation is entailed. My best results have been in adult patients where large doses of morphia have previously been given.

The following is a brief summary of the cases.

(1) Male 56. brought into hospital doubled up with all the classical symptoms of asthma present. Morphia gr.$\frac{1}{4}$ was given hypodermically on admission, but as breathing did not improve chloroform on a towel was administered one and a half hours afterwards for a period of 6 minutes. When anaesthetic was withdrawn breathing became fairly regular, pupils contracted and he enjoyed six hours refreshing sleep and next day was able to leave the institution feeling apparently cured.

(2) Male 52. case very similar to above. Hypodermic of morphia gr 1/4 given on admission, 30 minutes later another 1/4 was given, an hour later all symptoms were aggravated, so chloroform, two drachms was given and in less

than four minutes the paroxysm had abated and patient allowed a welcome rest.

(3) Male 32. was seized with an attack while an in-patient for another complaint; nepenthe thirty minims given at the outset, an hour later got a hypodermic injection of morphia gr 1/4 with atropine gr 1/50 also potassium iodide grs 20 as there was no obvious relief noticed chloroform was tried and after two drachms had been given the patient was at once relieved.

(4) Patient 64. hypertrophied left ventricle, albumen in urine, was an in-patient of medical wards for renal disease, when early one morning got an asthmatical seizure which he says came on twice a year. Morphia being contraindicated iodide of potassium and stramonium was given but his condition grew so alarming that $CHCl_3$ was exhibited, after the first few inhalations the result was magical; quantity used was only half ounce and the seizure passed off without patient really losing consciousness.

(5) Girl 16. convalescing from chorea seized with an attack; chloroform with difficulty

administered as in addition to the asthmatical trouble, the purposeless movement of chorea were well marked, her expirations were enormously prolonged and inspirations hardly perceptible; five and a half drachms of chloroform used in 8 minutes. The result was not very satisfactory and in 4 hours time she got a return but in a much milder form. Taking into account that it was not a pure asthmatical seizure and patient was of a highly neurotic character, the anaesthetic was not used again.

(6 & 7) Porter 28 yrs. said he had been in attack for 14 hours when admitted, was very exhausted, sitting bent up and dreading the slightest movement; several remedies had been tried outside, including as we ascertained later a dose of apomorphine. On admission 2 m of atropine given and 13 minutes later chloroform commenced, two drachms used and in 5 minutes breathing improved, chloroform stopped, free emesis and attack ended. Patient remained in hospital a fortnight when he got a second seizure and this time $CHCl_3$ was used at once with best results.

PNEUMOTHORAX.

For this I have anaesthetised 7 different patients and their condition in each case might truthfully be called critical. Before making any remark I append a tabular statement of the cases

CASE 1. J. O'C., age 26, suffering from 16 stabs and a fractured clavicle, anaesthetised to arrest hemmorrhage, Chloroform 3 drs. used. Length of time 16 minutes. No after effects.

CASE 2. E.S.H., age 47, admitted with bullet wound in left lung, left arm and right femur, chloroform 6 drs. used for extraction of bullet. Time 25 minutes. Great collapse afterwards.

CASE 3. G.B., age 18, punctured wound through left lung, diphragm and spleen, chloroform 2 drs., administered for 6 minutes, to examine wound. Very sick afterwards.

CASE 4. W.W., age 26, stab into right pleura, chloroform 4 drs., administered for 14 minutes to arrest hemorrhage. Vomited afterwards.

CASE 5. D.L., age 29, admitted with all ribs of right side fractured, also right ilium,

and compound fractured leg, chloroform 5 drs., given for 12 minutes to reduce fracture.

CASE 6. G.C., age 22, fractured ribs, sternum, & pelvis, chloroform 3 drs., exhibited for 8 minutes during adjustment of patient on a Hamilton splint. After effects, vomiting and great collapse.

CASE 7. G.H., age 43, phthisis, bronchiectasis. Chloroform 4 drs., employed during operation for drainage of abscess cavity. Length of time 8 minutes. No vomiting afterwards.

I refer to the above cases in detail where anaesthesia was seriously complicated.

In Case 1. where a policeman was attacked by a gang of roughs and frightfully maltreated, receiving 16 stabs in various regions , his whole body was a mass of bruises, he was quite pulseless on admission and apparently dying; saline solution 20 oz was injected over left breast, after which he rapidly improved, but concurrent with improved condition came a return of bleeding, so chloroform, three drachms was given to arrest hemorrhage in the intercostal arteries and scalp, and get the wounds clean; the whole time occupied 16 minutes. Previous to admission he got one ounce of brandy. He was semi-conscious and two drachms of chloroform was sufficient to anaesthetise him and one drachm kept him under until completion of operation. He breathed with great rapidity when going under but afterwards breathing got very shallow and at the close after the various stab wounds in chest had been packed the respirations were barely perceptible. He did not properly recover consciousness until next day, but as both breathing and pulse improved nothing was done to arouse him.

Case 2. Gentleman shot in his office by a lunatic; on admission a bullet wound was found anteriorly between 5th & 6th ribs and there was extravasation of blood

in muscles of back between 9th & 10th ribs, a bullet in thigh and another in left arm. Patient was practically in extremis; left lung quite collapsed, breathing caused intense pain, a rectal injection was given of hot brandy, morphia & atropine given hypodermically and oxygen per mouth. Any operation on patient was quite impossible, however he was radiographed and 16 hrs later when his condition had somewhat improved $CHCl_3$ was given with a towel, one drachm applied at a time, when going under he talked at a very rapid rate, evidently going over the scenes of the previous day, but he never struggled and breathed quite regularly throughout; after 6 minutes he was ready for operating and was then turned on his injured lung; the bullet successfully extracted from the back and also fragments of the 10th rib which had been splintered by the bullet. When the large drainage tube was inserted into the wound he made deep efforts to gasp but as the $CHCl_3$ was increased breathing became regular again. Throughout pulse remained regular, was 86 at commencement and 92 at termination of operation. When bandages were applied his color and breathing became very bad so the oxygen cylinder was brought into requisition and continued for 2 hours, after which

he became quite conscious and progressed very favourably.

In this case, after the 2 hours passed, patient revived wonderfully; to commence with he had only one lung and that was bronchitic though not to any marked degree, the oxygen before I think considerably aided the administration, which was extremely critical, for any mishap in breathing, artificial respiration of one lung did not promise much.

This was the most critical case I had and it was only after a long consultation between two of the physicians and three of the surgeons that they decided on $CHCl_3$ and timed it for 25 minutes.

Case 3. Lad 18 years, stabbed by a sailor with a bowie knife between 7th & 8th ribs in axillary line, penetrating pleura, lung, diaphragm and spleen. On admission 18 minutes after assault, blood was pouring from wound; immediately $CHCl_3$ was exhibited with patient in dorsal attitude and with the first few inhalations he lost all color and breathing became exceedingly bad. Strychnine and Atropine was administered and 1 drachm of $CHCl_3$ applied again, lad turned on the injured side and he breathed better and examination found state of things mentioned above. 2 drs. altogether given but an examination

of the wound revealed a hopeless state of things so it was at once discontinued and in a few hours patient succumbed to hemorrhage (internal).

CROUP AND DIPHTHERIA

The production of anaesthesia in the above diseases involves great responsibility, for as a rule the anaesthetist is too often not called in until the patient is in extremis, at least that has been my experience, as the patients were only sent in for operation after all palliative means failed. Chloroform was the anaesthetic selected in all cases and I think it is the only admissible anaesthetic under such conditions. All my patients were under 2½ years, five suffered from croup, two from diphtheria, in four of the cases tracheotomy was performed, in the remaining three inhalations were given to relieve spasm. In a future chapter devoted to Anaesthesia in children I will refer more in detail to this matter.

SUMMARY: * * * * *

In carefully reviewing my notes of anaesthetising patients suffering from some lesion of the respiratory system, I am driven to one conclusion viz:- that with such patients at any age and in any condition when an anaesthetic is indicated chloroform should be given, if any deviation from this rule is

permitted it should only be in cases of empyhysema when A.C.E. might with advantage be given but like chloroform by the open method with a free supply of air.

In my administrations to phthisical cases I found that ether answered wonderfully well and on this subject I wish to make a few remarks on a point which I don't think is brought into sufficient prominence in text books on anaesthetics viz:- the infection carried by face pieces and inhalers.

No face piece in general use to-day is capable of thorough sterilisation, true one can soak it in some antiseptic lotion but anything in the way of boiling is quite out of the question as all are made either of leather or celluloid. So in large hospitals where ether is the routine anaesthetic the face piece saturated with saliva, mucus, and expectoration from a phthisical patient is cleaned with a moistened sponge towel and immediately transferred to the next patient who may be in a very weakly state of health the result of some surgical affection.

One hears so much about tubercular infection and reads daily of strenuous efforts made to stop the spread of phthisis that it is astonishing such a

fruitful source of contagion has escaped serious notice by the profession. Certainly in all my cases I took every precaution to disinfect the face piece thoroughly after using it on a phthisical patient, still I always had the feeling that in transferring the face piece to another patient for a prolonged operation I was undertaking a grave responsibility and on this ground alone I say any anaesthetic which necessitates a face piece is contra-indicated in any respiratory affection, but especially so in phthisis or pneumonia.

CIRCULATORY SYSTEM.

	Chloroform.	ACE.	Ether.	Gas.	Gas & Ether	$CHCl_3$ & Ether	Total.
Anaemia: with functional murmurs.....	41		8	16			65
Atheroma (marked)..	7	29					36
Valvular Disease (Mitral Disease	8	9	7	4			28
Valvular Disease (Aortic Disease	6	2	1				9
Valvular Disease (Mitral and Aortic Disease)	2	1					3
Fatty Heart	8	15		6			29
Hypertrophy of left ventricle	3	2	2				7
Pericarditis.	1		2				3
Aneurysms of great vessels..	5						5
	74	38	52	20			185

ANAEMIA

To patients suffering from anaemia I have given anaesthetics 65 times, the anaesthetics used were Chloroform, Ether & Nitrous Oxide. The analysis is Chloroform 41. Ether 8. Gas 16. Fifty one of the cases were females, ages varying from 12 to 34 years, fourteen males, youngest 18½ years, oldest 56.

In the whole of the cases the anaemia was well marked all the cardinal symptoms being present. In some of the younger female patients breathlessness threatened to be troublesome, but when once the anaesthetic began to act, breathing soon became normal, though as a general rule it was very shallow.

It is usually taught that in anaemia with chloroform or ether very much less is required of the anaesthetic to render the patient insensible, however on referring to my notes of the amount used I found that it required practically the same quantity of the anaesthetic in anaemia as in other diseases. While this is true of the amount necessary to produce anaesthesia it is equally true that very much less is required to maintain it and at the completion of the operation the patient rapidly recovers consciousness.

Chloroform was administered by all methods and in nearly all cases a deep degree of anaesthesia

produced, though in some neurotic young females with the bruit de diable well marked and palpitation of the heart a prominent symptom, only a light anaesthesia was aimed at but in all cases the anaesthetic was well taken and left nothing to record. Vomiting occurred in 7 cases - 3 of these were emergency operations and with the emesis there was a corresponding amount of prostration.

The foregoing observations refer only to Anaemia as a disease per se. The results of Anaesthesia in some extremely critical cases of Anaemia following hemorrhage will not be considered here but will be more appropriately dealt with under "Shock." (page 80)

ATHEROMA.

Thirty six anaesthetics were administered to patients suffering from well marked atheroma viz chloroform seven times and A.C.E. twenty nine times. Other complications co-existed in all the patients and the majority were over 50 years of age. Bright's disease was the commonest of these added complications. All the patients who were chloroformed gave every satisfaction. A Skinners mask or a towel was used and administration gradual, all kept a good colour throughout, no struggling or cyanosis and practically no after sickness or nausea.

A.C.E. has been so largely praised as an aneasthetic in this disease that I used it in a large number of the patients, 29 altogether and the result was highly satisfactory. In some of the cases the condition of the heart was a very grave consideration and in a few of the patients advanced kidney mischief was superadded.

In all cases a Skinner's mask was used, taking of course the usual precaution to ensure a plentiful supply of air and to withdraw the mask on the slightest attempt at struggling or irregular breathing. The face remained a good color throughout, unless the operation was prolonged when the lips and cheeks became dusky. The pupil is not such a serviceable guide here as in either chloroform or ether and it is difficult to keep it in a fixed state for any length of time, however any unusual dilatation accompanied by insensibility of conjunctiva is a certain indication for the speedy withdrawal of the mask.

The advocates of A.C.E. in cases of atheroma advance the following reasons for its exhibition:-

(1) Can be used instead of ether, because while maintaining a healthy circulation, it never becomes so vigorous as to cause any risk of

cerebral hemorrhage.

(2) Can be used instead of chloroform, because in cases of cardiac mischief there is less liability to syncope on account of the ether present in the mixture.

(3) Lessens risk of respiratory trouble and after sickness.

My experience was that it answered all the qualities of a dilute chloroform mixture.

Having regard to the very considerable rise in arterial pressure which always results from the exhibition of ether I have never felt justified in administering it to this class of patient. To my mind to increase the already high arterial tension which is the essential factor in producing this pathological condition is irrational and dangerous. Comparing the relative advantages and disadvantages of A.C.E. mixture and Chloroform I have found, that although A.C.E. takes a longer time and a larger quantity to to produce insensibility yet its pleasant odour, the rapidity with which consciousness is reestablished and the presence of ether in the mixture neutralising any depressant action of the chloroform make it a more desirable Anaesthetic in this condition.

FATTY HEART

There is no doubt that a large proportion of the deaths which annually occur during the administration of anaesthetics are due to the above disease.
It is a treacherous disease and in a number of cases is more often suspected than diagnosed, age is no guide as the most fatty heart I have seen was in a young man of 26 who died suddenly in a gymnasium.
Again the actual degree of fatty degeneration present can not be estimated by the physical signs as Osler truly says "the diagnosis of this condition is notoriously uncertain."
The twenty nine cases I have grouped under this head were characterised by the following symptoms:-
Apex beat displaced outwards, cardiac impulse feeble, some cases imperceptible, radial pulse slow and irregular, murmur audible at apex, but heart sounds generally were muffled and distant. In eleven of the cases, patients were over 55 years and had arcus senilis well marked, the remaining 18 were over 30 years. I always made it an invariable rule when the above stethoscopic signs were present to percuss the area of cardiac dulness. By so doing I frequently gained invaluable information as to the extent of dilatation present, though of course

in some cases it elicited nothing.

Eight administrations were made with chloroform and I give note of one as an illustrative case.

W.W. aet 68, a gentleman passing through Liverpool accidentally fell down a ship's hold, dislocating his left shoulder. After the lapse of three hours he was brought to the hospital but all attempts at reduction without an anaesthetic failed, so after consultation it was decided to produce relaxation of the muscles with ether.

Patient was a tall ruddy faced very corpulent individual with rather a barrel shaped chest. Examination of the chest revealed nothing important in the lungs except prolonged expiration, but the heart was not nearly so satisfactory, the apex beat was felt feebly 1¾ inches outside the nipple line in the 6th interspace, while a distinct sharp high-pitched mitral murmur could be heard at the apex, cardiac dulness also increased. Pulse at the wrist was weak, small and irregular. The man evinced no unnecessary excitement previous to the administration, he said he never had any illness to speak of save an occasional twinge of gout, and in latter years complained of a slight winter cough. Arcus senilis present. He had lunched 4 hours previously

and had partaken of a little wine in the interval. With the above history it was decided to give ether but patient announcing his intention of sailing in less than an hour to fulfil an important engagement in Dublin, ether was discarded for chloroform. Skinner's mask applied and 1 dr of chloroform was given every minute, but he continued to take only the faintest inspirations so that at the end of 5 minutes he was quite as conscious as when the chloroform was commenced. I then suggested that he should take deep breaths and blow the anaesthetic from him, this he did and at the end of 9 minutes he commenced to talk voluminously , a minute later he was deeply anaesthetised without the slightest attempt at struggling. The dislocation was immediately reduced and anaesthetic withdrawn. Within 5 minutes he was again conscious, and in less than an hour was on his way to Dublin where he reached next day feeling none the worse for his adventure.

VALVULAR DISEASE is met with in patients at all ages, and their anaesthetisation exacts more than ordinary care on the part of the anaesthetist but providing the cardiac muscle itself is not undergoing degeneration or the subject too pronounced an alcoholic, there is seldom any alarm experienced.

Taking lesions of the mitral valve first I found that 28 patients were treated, the Anaesthetics used were Chloroform 8. A.C.E. 9. Ether 7. Gas 4.

In the cases where the symptoms were not well marked ether was selected and given as usual with the Rumboll -Birch Inhaler, the face piece was removed more often than in a normal case and patients were anaesthetised without difficulty. The after result was not so encouraging as crepitations persisted at the basis for some days in some of the cases, and in all evidence of bronchial irritation was shewn by a frequent irritating cough.

In none of the seven cases was albumen present to any great extent.

A.C.E. was given to nine patients, 5 suffering from constriction of the mitral orifice with a well marked presystolic murmur. A Skinner's mask was used in all cases, and the result highly satisfactory.

ILLUSTRATIVE CASE. Boy aet 11. profoundly anaemic with a history of an attack of haemoptysis the previous day, was run over by a waggon and had his foot badly crushed. On admission was suffering severely from shock, pulse most irregular in rate & rhythm, breathing shallow and rapid. Morphia gr $\frac{1}{8}$ was given hypodermically and 30 minutes later adminis-

tration commenced. After 2 dr. had been dropped on the mask breathing became slower and deeper, pulse more regular, skin bathed in a profound perspiration. Symes amputation performed, operation lasting 28 minutes, during which time it was only necessary to further use 2 dr. of the mixture. Shortly after removal to the ward he vomited slightly and consciousness rapidly returned and with it an improvement in pulse and respiration.

For the 8 cases where Chloroform was the anaesthetic selected the patients ages ranged from 12 to 56 years and all suffered from cough, dyspnoea, and oedema of the lungs, this added to the general venous congestion of all the other organs and presence of albumen in the urine quite precluded the employment of ether. The towel was used in each case and the chloroform exhibited in small quantities gradually, the result was absence of all struggling, regular respiration, a comparatively good pulse, good color and a perfect anaesthesia throughout operation , although in one case - excision of mamma - the operation lasted 80 minutes.

With regard to patients suffering from aortic disease my experience has been largely confined to chloroform, though I have given both A.C.E. and ether in the

presence of this disease. In the whole of the cases classified under Aortic disease, the lesion was well marked and the accompanying symptoms to my mind quite contra-indicated any other anaesthetic but chloroform.

I here append some notes of two cases of cardiac disease which caused some anxiety. In the first case the importance of a previous stethoscopic examination is well shown, because here a child was sent to hospital for immediate operation - trephining for mastoid disease - she looked ill and her condition was serious, examination of heart elicited facts detailed in the case, but furthermore the preliminary examination of the chest detected a condition of the left lung which was of paramount importance to the anaesthetist, when later it became necessary to turn the patient on her side. In this case it fortunately happened that it was convenient to turn patient on her affected side but had it been necessary to reverse the order of things the knowledge gained by the preliminary examination would have averted catastrophe, which must surely have occurred if patient had been turned on her sound side.

C.A. aet 14, school girl sent in for operation for

mastoid disease.

Condition at time of operation. Pallid, anxious expression, head drawn to right side, P. 144, R. 48, T. 103^{6}.

Physical exam of chest:- Heart a triple murmur heard at mitral orifice at tricuspid a double murmur, some enlargement of heart to right side. Lungs:- dulness on the 8th 9th 10th & 11th ribs of left side and absence of all breath sounds. On right side the expiration was prolonged, otherwise normal. There was a tense swelling over the right sterno-cleido mastoid, with some discolouration of skin, at first thought to be a phlebitis of external jugular and diagnostic puncture made between 9th & 10th rib when a syringeful of foetid pus was the result.

The surgeon operating decided to trephine the mastoid having regard to the condition of patient.

$CHCl_3$ was anaesthetic with the following result:-

4.15. 1 dr. applied with S.M.* 6" from face, patient lying on back, ribs greatly sucked in and also supra-sternal notch during inspiration.

4.17. 1 dr applied patient breathing rather laboured with a sucking in of ribs in left side.

4.18. 1/2 dr. added.

4.19. Patient now turned on left side, vomited a

* Skinner's Mask.

little soda water, coughed slightly, mask removed.

4-19½ 1 dr.applied.

4-20. Conjunctival reflex gone, breathing still difficult. Inspiration crowing, nasal breathing very marked.

4-21. Operation commenced.

4-24. 1 drapplied, pulse very feeble and irregular, respiration quieter.

4-29. 1/2 dr applied.

4-32. Operation finished.

4-45. Conjunctival reflex present, began to cry and retched slightly.

4-50. Was quite conscious, asking for water and said felt better.

Time 17 min. Quantity 5 dr.

In this case, not only was respiration a big element, but the condition of the heart was one to cause the anaesthetist the greatest possible anxiety. While in the dorsal position the patient looked ghastly and the sucking in of ribs and supra-sternal notch with clutching of fingers was a sight to daunt the courage of the average anaesthetist. When she was turned on the diseased side and the healthy lung had more play, the breathing got decidedly better and there was no further bad symptom. As only a hurried

examination of child could be made the exact condition of affairs was not fully realised until the child's death which occurred 3 days after operation. The autopsy revealed a very serious condition indeed. Briefly the tricuspid valve was practically absent, a few vegetations alone remained, the anterior cusp of the mitral was also diseased. The lower lobe of right lung was occupied by a pyaemic abcess, 12 dr of pus was found in left pleura. Spleen contained a large infarct and both kidneys were simply riddled with pyaemic abcesses. The swelling of neck above mentioned was found to be a large pus cavity underneath the S.C.M.* which burrowed well in amongst the muscles of the neck.

The last condition I will refer to under the circulatory system is that of aneurysm. Altogether I had five cases of aneurysm, two of the aortic, one traumatic of the femoral and two of the popliteal With all chloroform was selected and the result was satisfactory in the highest degree.

With one of the aortic cases we frequently gave him a few inhalations of chloroform to relieve a severe pain of an anginous nature. In all he received 9 administrations extending over a period of 7 weeks and it always afforded instant relief and patient

*Sterno-cleido-mastoid.

invariably enjoyed a sound sleep afterwards. The chloroform was never given beyond the degree of insensibility to pain.

In dealing with a patient suffering from aneurysm the first aim of the anaesthetist must be to prevent struggling and obviate any strain upon the circulation generally. This can be most effectively done by the employment of chloroform, administered very slowly on a towel with a free supply of air. In the following case the patient was in a very critical condition and I give a full account of the anaesthetisation.

ILLUSTRATIVE CASE

Popliteal Anuerysm. Aortic Regurgitation.

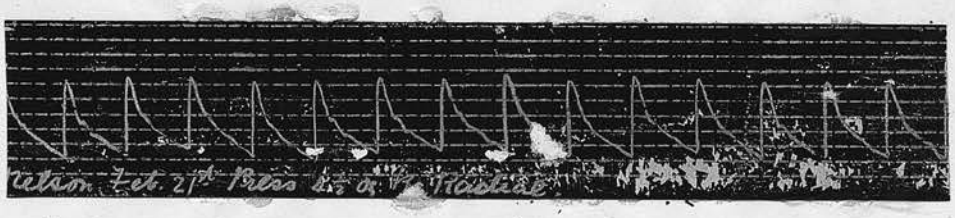
N.M. aet 40, Norwegian Sailor Came to O.P.R.* with well marked popliteal anuerysm.

History. First noticed swelling 3 months before and went to Dreadnought Hospital Greenwich. The authorities there proposed to patient to ligature Femoral by aid of cocaine as after physical examination they did not feel justified in giving him any of the ordinary anaesthetics. This he declined and came to his home in Liverpool, was seen by a Doctor in practice in the city and sent into hospital for treatment.

* Out-patient room.

Right radial. pressure 4 oz

Left radial. pressure 4½ oz.



Right radial. pressure 4½ oz.

Right radial pressure 6 oz.

Pulse tracings of case described on opposite page. (Dudgeons sphygmograph)

Condition of Patient on day of Anaesthetic. Strong looking man with very marked pulsation of all vessels of neck, expression very anxious. Heart dilated and hypertrophied left ventricle, apex beat 1¼ inches internal to nipple in the 5th interspace, well marked aortic regurgitation. Mitral Area, reduplicated 1st sound, weak diastolic murmur. Tricuspid double murmur loud diastolic at Xiphisternum.

Aortic Area, double murmur, systolic transmitted up carotids.

Pulmonary Area, double murmur.

Pulse tracing attached, shews suspicion of inequality

After consultation between physicians and surgeons it was decided after explaining risks to patient to administer chloroform.

Half an hour before anaesthetic 1 oz of brandy was given to patient as he complained of faintness and fear.

H. M.

2. 40. $CHCl_3$ one drachm on towel.

2. 42. 1 dr. repeated.

2.43. 1 dr. " breathing quite tranquil.

2. 46. 1 dr. "

2. 47. 1 dr. "

2. 48. 1 dr. " Colour very good, pulsation very prominent.

2. 50. 1 dr. repeated. Conjunctival reflex gone pupils contracted.

2.51. 1 dr.

2. 52. 1 dr. Abolition of sensation, motion & reflexes. Breathing slow and regular, pupils contracted.

2. 53. Operation commenced of ligaturing femoral at apex of Scarpa's triangle.

3. 1/2dr. added, pupils beginning to dilate.

3. 3. 1 dr. added pupils again contracted, lips alternately rose red and pallid.

3. 12. 1/2dr. added

3. 20. " "

3. 32. " " Breathing quite calmly.

3. 35. Operation completed and patient carried from theatre.

Time under anaesthetic 55 min. Quantity 12 dr. Was conscious at 3. 50. and had no sickness or any ill effects.

Pulsation unfortunately recurred in aneurysm 4 days later necessitating religature of the femoral which was accordingly done 16 days later, this time in Hunter's Canal. Precisely the same means adopted in second anaesthetisation as in the first with practically the same result. The patient was fully anaesthetised in 12 minutes, a minute quicker than

before, and time of anaesthetisation lasted 58 minutes, or three minutes longer, but quanity of chloroform used was same viz., 12 drachms.

SUMMARY.

In perfectly healthy individuals there is a well defined margin - an anaesthetic band - within which you may safely keep your patient according to the degree of anaesthesia required, but when disease of the heart or vessels is present this anaesthetic band becomes proportionately limited, as it were your anaesthetic pendulum now oscillates through a much smaller arc than in a normal case.

Now in considering the difficult subject of the choice of an anaesthetic in patients with valvular affections, a narrow view of the question is inadmissible nor must the administrator suppose that his responsibility ends with the safe return of the patient to his ward. We have to consider firstly the characteristics of the pre anaesthetic state in the case of the drug used, secondly those of the anaesthetic state, and lastly the post anaesthetic phenomena, contrasting first the initial manifestations:-

The struggling and respiratory embarrassments caused not unfrequently by ether as well as the nervous dread sometimes induced by the sight of the elaborate methods taken for its administration absolutely contra-indicate ether in two circulatory

troubles viz. Atheroma and Aneurism and render its use inadvisable in most others.

A.C.E. is better but takes a very long time to act if given properly i.e. by the open method. Practically a dilute chloroform mixture, the same safety can be secured by giving Chloroform with plenty of air.

Coming now to discuss the period of insensibility, although the limits of the anaesthetic band in the case of $CHCl_3$ are straighter than those of its rival ether, the ratio being nearly as possible identical with that expressing their relative strengths, yet the fact remains that in cases of death from chloroform, the majority of the victims have been free from valvular disease i.e. patients with valvular disease are but rarely killed by chloroform.

It is however in the after effects that ether compares so badly with $CHCl_3$ in people with heart disease. The lungs already have a tendency to become water-logged, or perhaps are even so. The attendant evils of this condition, cyanosis, dilatation of right heart, oedema, are too well known to require description. Even in well compensated cases this tendency is there and by the

powerful aid of ether is strengthened to a dangerous extent.

I conclude then by advocating chloroform as the anaesthetic of choice in the majority of cases complicated by valvular lesions.

NERVOUS SYSTEM.

The most frequent affection of the nervous system which the anaesthetist is asked to deal with is undoubtedly shock.

In surgery shock is definitely separated from syncope, but as far as the anaesthetist is concerned any such demarcation is unnecessary. Whether the condition is due to concussion of the brain, the severance of a large main artery or a simple mental impression, the result is the same viz: a general depression of all the functions of the nervous system.

In hospital practice - especially where the work is large ly accident - every degree of shock is met with, the usual variety might be best described by citing an illustration.

A young man had his hand caught in a cogwheel, 3rd, 4th & 5th metacarpal bones splintered, whole hand black with machinery grease, first aid rendered at the factory and patient immediately transferred to hospital; shortly after he reaches ward complains of feeling faint, and perhaps for first time since accident feels pain, lips become pale, whole face white, pupils dilated, respiration increased in frequency but very shallow, pulse frequent and very

often fluttering, forehead is bathed in perspiration at first then the whole body becomes moist. If he has recently had a full meal he vomits and his condition improves, if not all the above symptoms are increased until remedial measures are adopted, any manipulation of wound causes intense pain. In such a case morphia would be given hypodermically immediately, if prostration was very marked atropin would becombined with the morphia. In a case similar to the above described where dirt and grease begrime the wound, it is extremely important that it should be rendered as aseptic as possible, so no time is lost in anaesthetising the patient and attending to the wound. Chloroform would most probably be selected and given by one of the open methods, preferably with a towel.

Under shock I would like to refer to another class of patient of the greatest interest to the anaesthetist viz: the alcoholic individual who is brought to hospital on an ambulance stretcher, suffering from a large incised wound, extremely collapsed whether from alcohol or loss of blood or both it is impossible to tell, probably both.

A typical case is where a drunken man, aged about 30 pushes his arm through a plate glass window,

severing all the muscles, vessels and nerves of the fore-arm. On admission he is very restless, talks continuously in an incoherent manner, should he try to rise he falls backwards in a faint, his extremities are quite cold, his face and body bathed in perspiration, lips and gums pallid, pupils widely dilated, respiration rapid but shallow, if a pulse can be felt at the wrist it is frequent, feeble and irregular, usually it is imperceptible, he has an insatiable thirst, but if fluid is given him he promptly vomits. Transfusion is often necessary, then atropin and morphia given hypodermically and patient wheeled into the theatre for operation. Auscultation of chest elicits nothing abnormal in the lungs, but heart sounds are extremely feeble. This type of patient is so frequently met with at the hospital that an excellent opportunity is afforded for comparing the relative merits of the different anaesthetics, but as only chlorofrom or ether was employed the sphere of observation must be limited to these two drugs.

A clinical study of such patients under the influence of chloroform and ether I append:-

Chloroform is exhibited on a towel, patient is breathing very shallow, rather rapid, pupils are

fully dilated at the outset consequently are useless as a guide to the depth of anaesthesia present; lips afford no information on account of their pallor, consequently all attention must be centred on the breathing. What is the sequence of events which we find under $C.H.Cl_3$? well it is usually this:- After a few inhalations there may be an abortive attempt at struggling, breathing becomes more rapid, then incoherent talking, and perhaps a further attempt at struggling, this is followed by slower, deeper and more regular respiration, conjunctival reflex now absent, and patient suddenly shews evidence of embarrassed breathing, if more chloroform is added breathing stops, if discontinued he partially recovers sensibility, so here is the dilemma of the chloroformist. To commence with we have a certain amount of anaemia of the respiratory centre, and when $C.H.Cl_3$ is inhaled there is always a certain amount of circulatory disturbance which results in the fall of blood pressure - vaso motor palsy - so that really we increase the original pathological condition, hence the risk of respiratory failure which if not properly and promptly interpreted would very soon usher in a fatal cardiac syncope.

Turning now to the administration of ether to a

similar case I find that when given with a Rumboll Birch, respiration is at first very hurried, some struggling ensues, then breathing becomes regular and deeper, there is a somewhat hectic look about patient's face, but the withdrawal of face piece and admission of air rapidly improves his color; possibly there is free salivation, but the condition of patient improves as etherisation proceeds. It is generally accepted that ether is our best cardiac stimulant, it increases the pulse rate and stimulates the activity of the vaso-motor centres, exactly the condition of affairs we seek in the presence of this morbid condition.

Clinically I have found this fact emphasised time after time and cannot too strongly urge its employment in these cases of profound anaemia from traumatism

In certain cases of complete collapse following injury, even ether is not stimulant anough, a valuable auxilliary may be then found in the simultaneous use of oxygen, as exhibited by the Rumboll Birch gas and ether inhaler.

Illustrative Case:
Shunter, 33 years, knocked down by engine, compound comminuted fracture of right humerus, skin over pectoral muscles torn off, scalp wound, haematoma

of back, haematuria, fractured pelvis. Accident happened at 7. 40 a.m. patient admitted in a dying condition at 8. 5 a.m. Strychnine 5m & ether 15m given immediately, at 9 a.m. he got morphia $\frac{gr.}{1/4}$ as pain was intense, at 11.30 the same dose of morphia was repeated, the carotids could scarcely be felt. Brandy was given by the mouth 2dr. every half hour. At 3 p.m. it was decided to remove remaining stump of humerus, so hot brandy $\frac{oz}{20}$ was given per rectum and at commencement of operation 16 oz. of saline solution was transfused into the median basilic vein on the left arm. Strychnine 5m atropin 2m given before administration of ether.

Condition of patient at time of administration: Breath sounds clear, respiration slow, sighing, shallow. On auscultation the second sound could be heard occasionally very faint indeed, lips quite pallid, pupils widely dilated.

Anaesthetic:- Ether & Oxygen by a Rumboll Birch.

H. M.

3.10. Index $\frac{1}{4}$

3.11 " $\frac{1}{2}$ Respiration shorter but increased

3.12 " 1^{o} and very gradually but constantly moved until it reached 2^{o} at 3.13$\frac{1}{4}$ min.

3.15. Operation commenced & index turned back to $\frac{1}{2}$.

and kept at that (being removed at every 10th inspiration and replaced after allowing him to breathe pure air twice) until termination of operation at 3.50. Quantity 14 1/2dr. Time 40 minutes.
At termination of operation his color was slightly better and pulse at radial was distinctly felt 132. 18 minutes afterwards patient regained consciousness, no vomiting, felt better and progressed very well for 8½ hours when he suddenly collapsed and died.

In another case where a double amputation (thigh & foot) had to be performed, ether was first employed alone. When the thigh had been amputated his pulse could scarcely be felt and his condition was so bad that it was almost decided to desist from further interference. However ether and oxygen being tried the second operation was rapidly performed and the condition of the patient at its close very markedly improved, his pulse being better than when he was first placed on the operating table.

EPILEPSY

I have never used any anaesthetic to overcome the seizures of epileptics, but have frequently given chloroform to such patients about to undergo some form of surgical operation. Excepting in cases of Jacksonian epilepsy when patients were specially anaesthetised for some cerebal operation, I did not know of the existence of epilepsy prior to commencing the anaesthetic, when after a brief interval the characteristic symptoms soon manifested themselves. Epileptic patients show such extreme diversity of symptoms, and behave so differently under anaesthetics that one cannot lay down any general rule, but must be guarded by the condition of the patient at the time. If the breathing is fairly regular, color good, and there is no threatened emesis, I push the chloroform while if on the other hand there is any dyspnoea & lividity of countenance or attempts at vomiting, I withdraw the drug.

The after effects of chloroformisation in epilepsy are just as uncertain as their behaviour under its influence some cases rapidly regained consciousness without the slightest ill effects, others fell into a kind of trance, and slept for several hours, while one lad developed the status epilepticus.

ILLUSTRATIVE CASE :--

Boy aged 10 years, admitted at 10 a.m. with acute periostitis of tibia, pulse 128, temperature 103", respirations 22, vomiting and complaining of great headache, and history of three days illness. Four hours after admission, he was chloroformed, the towel folded as a cone used, when about 2 oz of the anaesthetic had been given, he went off into a typical epileptic attack, the color of lips and cheeks became brighter, and breathing was good, rather hurried, with a good deal of frothing at the mouth. The towel was removed from the face about six inches, and the chloroform freely sprinkled on until all convulsions ceased. Patient was twelve minutes under the anaesthetic, and one ounce four drachms used. At the completion of the operation instead of regaining consciousness he passed into the status epilepticus, and convulsion after convulsion succeeded one another in rapid succession, pulse rate averaged 130, respirations varied between 16 and 30 and temperature remained at 104°, this condition of things lasted 9½ hours when he partially regained consciousness, and fits stopped. Nepenthe 15 m was then given, and he passed a comfortable night. Next day he was morose, extremely irritable, refused nourishment, however, on the following day , temperature, pulse,

respiration were all practically normal, and the lad perfectly bright and amenable to treatment.

CASE 2.

Man, 36 found in a fit in the street by a policeman, brought to hospital in an unconscious state, with no history obtainable, but well defined attacks of Jacksonian epilepsy. During the first hour he had eight fits, and the second thirteen. As the convulsions were evidently caused by some lesion in the vicinity of the genu of the fissure of Rolando, the surgeon decided to trephine. Accordingly the patient was brought to the operating theatre, still absolutely unconscious, with fits becoming more frequent. Chloroform administered with a towel was selected to induce anaesthesia. After the first few inhalations he began to breathe better, but when the second drachm was added to the towel, he got a violent seizure, and so fixed his thoracic muscles that respiration was im-- possible. Firm pressure on the ribs gave little relief, so he was turned on the convulsed side, and artifical respiration performed with one arm, after about two minutes fit passed off, and patient replaced in dorsal position, when operation was proceeded with, but without any anaesthetic. During the operation which lasted 65 minutes patient had four brief attacks

each succeeding one being less in its intensity, but he never appeared to feel the slightest thing. No cause was found for the fits, but from the time of the operation until his discharge he made a perfectly rapid recovery. Questioned afterwards as to his previous history, he said he was always a healthy man, remembered leaving his work as usual, but after that everything was a blank.

The interest in this case is whether any anaesthetic should have been administered. This question was considered, and it was thought despite his unconscious condition to gime him some chloroform until the skim incisions were made with the object of averting fits, however, it did not, and all subsequent manipulations were done without any bad result.

AFTER EFFECT Four hours afterwards regained consciousness.

The following commentary on the facts detailed above is suggested by the very interesting behaviour of the patient under the anaesthetic.

I The unconsciousness resulting from head injury and the consequent cerebral mischief so induced is not ordinarily so profound as to enable us to dispense with anasthenia.

II In this case 2dr. only of the anaesthetic had been administered when it had to be withdrawn. Never the less the patient was perfectly analgesic throughout the operation.

III Two alternatives face us.

(a) That in reality the patient was sufficiently narcotised by the 2dr. of $CHCl_3$ administered (this being accounted for by his peculiar condition) to last the operation. or

(b) If not that, there are certain cases of head and cerebral mischief in which analgesia the result of unconsciousness is sufficiently well marked and maintained to obviate the necessity of an anaesthetic.

IV Taking the former alternative first. If the small quantity of the drug used was sufficient so to speak to give an impetus to anaesthesia powerful enough to last the period of operation a very interesting question demands a solution, viz:- What are the conditions required to produce such an effect?

Against this alternative we have the fact that

the patient in this case was not profoundly under the influence of the $CHCl_3$ as otherwise the epileptic seizures would have been impossible.

If then we accept the latter: Are there any signs which might guide us in differentiating between the two classes of cases (i.e. head cases requiring an anaesthetic and those which do not)

CHOREA

During the paroxysms of an attack I have given chloroform with the greatest benefit and if some opiate is given on the first sign of returning consciousness, a good rest is generally obtained and patients strength thereby saved.

In twenty choreic patients I have administered chloroform, 12 of whom had a cardiac murmur, they were all females, ages varied from 2 to 15 years.

Complete anaesthesia is seldom necessary when a opiate is given, if for any reason opium should be contra indicated, then deep anaesthesia should be aimed at, but I have not found this method so lasting in its effects as partial anaesthetia combined with morphia. In all the administrations I used a towel held at first some distance from the face and slowly added the chloroform. In some cases the patient will twist in all directions, but usually by following her movements rather than holding her down, anaesthesia is expedited and her safety assured. With chloroform one can do this; with ether and its cumbersome apparatus, the child must be firmly held until unconsciousness is produced.

In chloroforming children suffering from chorea it is essential to closely watch the breathing

alone as it is your only guide as to the state of the patient until muscular relaxation obtains

ALCOHOLISM is one of the most common derangements of the nervous system which the anaesthetist has to do with and in hospital practice it is by no means confined to the stronger sex. Whatever be the anaesthetic selected the administration of it to an alcoholic individual will invariably be troublesome.

In examining my notes I find that both with ether and chloroform the alcoholic always requires a greater quantity of the drug than a sober patient, that is if it requires 2 ounces of chloroform to anaesthetic a sober man for half an hour it would require perhaps 3 ounces of the drug to keep the alcoholic anaesthetised

There is invariably a good deal of unnecessary struggling during the initial stages and it is in such cases that the greatest care must be observed to prevent a catastrophe, patient shouts, fights, holds his breath for some seconds, then takes a deep inspiration, he repeats this performance a few times and at last he takes an over dose, which is so quickly and easily done that unless prompt measures are immediately adopted respirating embarrassment must ensue, and if this occurs the patient is so often the possessor of a fatty heart that a fatal cardiac syncope results.

To alcoholics I have given every kind of

anaesthetic for major and minor operations and the result of my experience has been briefly as follows.

Chloroform was always given slowly on a towel with full supply of air the patient was very seldom forcibly held down, the assistants guiding rather than restraining his movements. Shouting and talking rather assists chloroformisation, but holding the breath is a dangerious symptom and complete withdrawal of the towel should be done at once.

The after effects were vomiting in some of the emergency cases, temporary excitement for a brief period collapse in a few, but no symptom serious enough to cause any alarm, indeed in a lot of the cases the return to consciousness was characterised by the absence of anything special.

Ether given with the Rumboll - Birch usually caused some struggling, the fact of placing the face piece over the mouth and nose was sufficient to excite strenuous opposition, especially if the patient was drunk at the time of administration. The period of excitement is more prolonged than with chloroform and it requires the full staff of the assistants to keep the patient from jumping off the table, main force must be used during the initial stages of etherisation.

AFTER EFFECTS If patients are under the influ-

ence of alcohol at the time of operation there is nearly always violent retching afterwards unless the stomach contents have been evacuated in the early part part of the administration. However, the most constand and troublesome sequel is a wild delirium, in men it manifests itself in shouting, swearing, and tossing about. In women uncontrolable grief and every form of hysteria is seen. Fortunately for every one concerned it seldom lasts long and patients mentally is little effected. The danger of course, is that in the struggling the ultimate result of your operation may be imperilled, an experience I have seen once or twice in badly compound fractured legs.

With ether one frequently administers atropin as a prophylactic in case of subsequent respiratory trouble, and in the above class of patient I have frequently noticed that the delirium is intensified where atropin has been given. It is a difficult matter to speak with authority on this point, but certainly young women to whom a hypodermic injection of morphia and atropin is given on emerging from the effects of ether continue to ramble in their speech for a longer time than patients who are not so treated.

NITROUS OXIDE GAS causes excitation of all the nerve centres and an initial period of undue excitement during which patient may develope ankle clonus' jactations of arms and legs, tremors &c., but it is a all momentary and the alcoholic more suddenly falls under the influence of the gas, than the average sober individual. If ether is to be used for alcoholic subjects it should follow gas and I have several times given gas and ether with the Rumboll Birch with much acceptance, because when this method is employed very much less ether is required, and so the struggling initial stage of ether is eliminated and the uproarous after effect considerably lessened.

COCAINE Vide Chapter. page 139.

Before concluding my remarks on Alcoholism I would like to refer to an occasional complication which makes its appearance in the ward of large hospitals from time to time viz:-delirium tremens. Sometimes the delirium assumes such a character that an anaesthetic is necessary either for the patients own safety or the sake of the other patients. It is not a method of treatment generally recommended but in 21 cases I have administered chloroform from a few inhalation, right up to a profound degree of anaesthetia without experiencing any

anxiety and in each case allayed the delirium if not altogether, at least for sufficient time to try the efficacy of other hypnotics. According to Walsham (Theory & Practice of Surgery) 3 deaths occured at St Bartholomews Hospital alone in 7 years from this plan of treatment. Patients suffering from delirium tremens are usually shattered in health. All their organs are below par, fatty heart and diseased kidneys are often present and they are generally dosed to the full limit with various hypotics such as sulphonal, paraldahyde, morphia, hyocine. Should all these fail and patient is exhausting himself to such an extent that a speedy dissolution must soon take place I think chloroform is his last hope and under the circumstances should not be withheld. Chloroform is the only admissable anaesthetic, it should be sprinkled on a towel and held some distance from the face until patient quietens and then you can secure any degree of narcosis you desire.

Tetanus is fortunately one of those rare forms of nervous diseases seldom seen in surgical practice of the present day. Furthermore, it is one which imperatively demands an anaesthetic, if any drug by way of treatment is to be given by the mouth, or a paroxysm subdued. Gowers in his work on the nervous system speaks of

Chloroform as the most efficient agent we have to give temporary relief. "ether he says does the same but is less convenient" The same author says that chloroform given continuously does not seem to modify the course of the disease (Diseases of the Nervous System, Gowers Vol II page 695.)

Taylor advises the administration of chloroform once or twice daily to relax the jaws and enable food to be given (Taylor's Practice of Medicine)

Osler says "the spasm should be controlled by chloroform, which may be repeatedly exhibited at intervals" (Osler's Principles and Practice of Medicine)

Treeves in his system of Surgery Vol I says chloroform should be administered when the convulsions are violent and distressing and may be increased or diminished as found necessary

Hare recommends the use of chloroform if the convulsions prevent swallowing. Ether is too irritant and too slow to be used as a relaxant. Chloroform should be gently given between the paroxysms (A Text Book of Practical Therapeutics by R. A. Hare M.D.)

All the above authorities are unanimous in their advocacy of chloroform as a rapid and certain anaesthetic to subdue the paroxysms of Tetanus. Hare alone suggests giving the anaesthetic between the seizures,

and I think it should certainly be tried and I have no doubt would often avert a threatened attack. On the other hand Hewitt in his text book on anaesthetics and their Administration says "Sometimes a considerable interval of freedom from spasms may elapse after the inhalation of chloroform in which case no more of the anaesthetic meed be given until tetanic rigidity commences. Should spasm be continuous the administration may be maintained" The same author records a case of a child who was kept under the influence of chloroform for 13 days. 100 oz. being used. I give the details of a case which occured in Hospital last year.

Illustrative case J. M. aged 13 years, Errand boy, knocked off a waggon in the street, sustained a scalp wound extending from the vertex over forehead and into the right upper eyelid. On admission was slightly concussed, vomited twice, was chloroformed within an hour of admission.

From notes taken at the time I find

H.	M.	
2	20	$CHCl_3$ commenced with Skinners mask 1 dr. applied
2	22	1 dr. applied, patient breathing rapidly but regularly.
2	23	Patient quite under, deep snoring respirations, pupils contracted. Operation

commenced

H	M	
2	30	1 dr. applied
2	38	1 dr. applied
2	45	Operation completed.
2	55	Patient woke up crying, raised himself up in bed, vomited freely and then gave a lucid account of his accident.

At 5.30 had a cup of tea and little toast. Felt quite bright.

So he was under the influence of the anaesthetic 35 minutes and 4 oz was all that was necessary to keep him deeply under.

The interest in the above case is that the wound healed by first intention, all sutures were removed and lad was to be discharged on the 11th day following the accident when some facial paralysis appeared, for two days it was very slight and thought due to cold, however, on the 3rd day (14th day after injury) the diagnosis was unmistakeable, and as the paroxysms became frequent it was decided to give inhalations of $CHCl_3$, but the surgeons only allowed it to be given to the first stage. From the notes I find that the first administration was at 6.30 a.m. when 1 dr. was quickly poured on a towel and when spasm relaxed and conjunctival reflex gone it was 70 seconds. He slept

for 1½ hours, when paroxysms again commenced and C.H.Cl3 administered as before: This was repeated altogether 8 times, nothing of any note occuring, until the last administration when the spasms never relaxed and he died in ophisothotenos

My definite instructions in the case were "immediately at the onset of the paroxsyms, commence your anaesthetic, but cease immediately it is over" This I followed to the letter, and give notes of the different administrations taken at the time.

H	M		
6	30	Poured on towel CHCl3 2 dr	1st administration
6	31 (10 Sec)	patient under partially	
7	40	Poured on as before 2 dr	2nd
7	41½	Paroxysm over	
9	20 a m	As above, 2 dr.	3rd
2	21	" " 1 dr.	
9	21 (40)	Quite under	

At 10 20 a consultation was held and antitetanic serum injected.(15 cc)

11	5	1 dr. on towel	4th attack
11	6	passed off	

12 10 2dr. applied, attack very bad, would not breath arms drawn over head, thorax compressed

12 11 20 1 dr. applied, breathing 62 per minute,

pulse irregular in time, could not count it.) 5th
12 12 1 dr. applied and in about 20 sec he was under)
1 30 1 dr. applied before attack really started) 6th
so that he was not awakened from his sleep)

The lad appeared to be in a sound sleep so I left the ward for some time, during my absence he took another fit and was almost dead when I commenced the administration, he seemed to have fixation of all pectoral muscles and no air was passing through larynx at all so while I tried to administer C.H.Cl3 the House Surgeon got on top of bed and commenced artificial respiration, and thus we succeeded in pulling him through the attack

3 25 Commenced with 2 dr.)
3 26 Artificial respiration)
3 27 1 dr. applied) 7th
3 28 1 dr. ")
3 28 (30) Fit over)

The final fit occured at 4.42 he gave a short cry, twisted his neck almost round and in 30 sec was dead Artificial respiration was attempted for some minutes but the heart action had absolutely stopped.

4 42 2 dr. but spasm was so great th) 8th
never relaxed and so he never)
inhaled any of it)

One reads in our medical journals every week the usual heading "Death under anaesthetics" and I attach notes of a case which I think deserves the title "Life saved under Anaesthetic". I am not alone in this opinion as the whole of the staff are agreed that had rest not been so promptly secured the patient must certainly have succumbed from exhaustion. The notes I append will briefly describe the condition of affairs, in them it will be noticed that morphia gr ½ was given within an hour of the administration.

ACUTE MANIA or CEREBRAL IRRITATION FROM INJURY

W. McN: aged 23, labourer, working under a scaffold when a bag of lime weighing several cwt fell upon his head. Was brought into hospital within 20 minutes of accident and then had to be tied to stretcher, as was so uproarous, His head was one huge jelly like mass and it was quite impossible to feel any bone owing to the extravasion under the muscles of the scalp, both eyes were almost obliterated with the swelling, comminuted fracture of left clavicle. Morphia ¼ grs was given hypodermically immediately he entered the ward but in a quarter of a hour he grew quite demoniacal and four men could scarcely keep him in bed, Gr ¼ was repeated, but his struggling increased, the more resistance that was offered the more violent he became,

pulse 142 was now failing and everything pointed to a speedy dissolution from exhaustion, so it was decided to administed $CHCl_3$ Accordingly at 2 o'clock 1 hour after admission with a towel 1dr was applied and in 3 minutes another 1 dr. was added when his muscles relaxed and he quietened down, so the towel was removed but in less than a minute he was again violent so another 1 dr. added and at 2.5 he was fairly under. At 2 30 he commenced again and 1 dr was given with a Skinner mask, repeated at 2.31. Struggling ceased. 2.33 1 dr added and he was again quietened

3rd Admin:	3.40	1 dr on mask	
	3 41	1 dr.	
	3 42	1 dr. breathing regularly and quietly	
4th "	4 15	Same as above	
5th "	5	ditto	
6th "	6 10	ditto	

At 7 Patient woke up and spoke for the first time since admission asked for drink and complaining of pain in his clavicle. From this point on he never showed the least sign of restlessness. The haematoma of scalp and side of face remained fearfully tense and unsightly. Clavicle was set and patient made a good recovery

SUMMARY.

The purposes for which anaesthetics may be administered to patient afflicted with nervous disorders are not confined merely to rendering them unconscious as a preliminary to the surgeon's knife. There are cases where the anaesthetic is given for its own own sake, for its action on the nervous centres i.e. as a method of treatment. In some neuroses, notably in Acute Mania, Delirium, Chorea, and Tetanus we require just such an effect as can be produced by this class of drug and I am an advocate for their more extended and routine use in such states. If we analyse the end of treatment, in most cases, whether these be medical or surgical, it will be found as Hilton pointed out long ago that ultimately we aim at securing rest, physiological rest for a diseased or injured organ. We require an efficient mental splint and with anaesthesia we have a valuable ally. The importance of chloroform in affections of the nervous system cannot be over estimated, the simplicity of administration, the rapidity of action, the permanency of its effects and the immunity from subsequent respiratory trouble makesit invaluable.

The Alimentary System.

Diseases affecting the alimentary system do not influence the selection of an anaesthetic to the same extent as the systems previously described. Vomiting, is of course, always a troublesome complaint, but its presence never contra-indicates an anaesthetic. Preliminary preparation largely minimises the risk of emesis and under certain conditions (the so-called faeculent vomiting of late abdominal obstruction) washing out the stomach with a syphon tube prior to anaesthetisation is attended with most beneficial results.

Further reference is made to the use of anaesthetics in diseases affecting the alimentary system in describing operations on the abdomen.

THE URINARY SYSTEM.

I made careful analyses of the urine of fifty patients before and after the administration of an anaesthetic in the hope of tracing some relationship between albuminuria and anaesthesia. The question is a large one and many difficulties and inconveniencies stand in the way of its solution. This coupled with the limited time at my disposal tended to make the result of my investigations such that I was not encouraged to pursue the enquiry. As far as my observations go, I found that the amount of albuminuria which follows the administration of chloroform or ether very small indeed, often there is none at all. Albuminuria pre-existing, ether causes some increase in the condition. However, as I have already intimated, it is difficult owing to the presence of side issues and complications to obtain a fair field for research.

Personally I am of opinion that the presence of albumen in the urine is a contra-indication for the use of ether, and therefore employ chloroform.

In connection also with the urinary system I would like to draw attention to the liability of patients to sudden shock during manipulation of the kidney. This is shewn by pallor and alteration in the character of the respirations, and is especially well seen if

Anaesthesia is light or imperfect.

C H I L D R E N.

Under this heading is included all patients eligible for admission to the Children's Wards of the Hospital, the limitation for boys is 7 years, for girls 8 years. The total number of administrations to such patients amounted to 403, the very large majority get $CHCl_3$ a small percentage A.C.E. or Nitrous Oxide, and a fraction received ether.

The analysis of all administrations is:-

Chloroform.	A.C.E.	N_2O.	Ether.
347.	29.	18.	9.

Of all subjects I found children the most satisfactory-satisfactory alike to anaesthetist and operator - certainly great caution must be exercised in some cases, and in certain operations, and an overdose especially of $CHCl_3$ can easily be given. Children possess very expansive elastic chests and can easily absorb a great quantity of an anaesthetic even with one deep inspiration, but artificial respiration in young people, far more amenable to ordinary treatment than adults, is a simple matter and can always be done with telling result though I am happy to say, I never needed it in any of my own administrations.

Preparation of patient. If opportunity is given for special preparation of the little patient it need not

differ from that of an adult except in the matter of fasting, and I think any prolonged abstinence from food is very dangerous, especially so in weak anaemic children, or in children the subject of severe accident involving any great hemorrhage. Personally I should never allow them to be fasting more than 3 hours, even subjects in robust health, while weak debilitated children, I should give bovril or beeftea to, within 2 hours of operation. When it is remembered that the average child has no definite time for meals, but is feeding whenever an opportunity offers, one can understand that a long fast, especially if the patient realises an operation is pending must be a serious matter. If possible it is an excellent thing to secure the confidence of the child, or at least to calm the excitement this is specially necessary when the ether inhaler is produced. A similar examination of mouth, throat etc. should be made as in adults, this last is an important matter as children display a wonderful ingenuity in secreting sweets under the tongue or in the back of the mouth. If $CHCl_3$ is the anaesthetic decided on the face should always be smoothed over with vaseline to prevent any blistering.

Chloroform. As before stated I had occasion to give this anaesthetic 347 times for almost every surgical

operation and for times from 5 minutes to 90 minutes, and on children in every state of health, and in all with the best results.

In no class of patients are so many varieties met with, positively there is nothing common to guide one in chloroformisation except the breathing, the corneal reflex so useful in the adult is never to be relied on, it may be observed in deep narcosis, absent after the first inhalation, sometimes it suddenly disappears during administration but the patient is in no wise under the influence of the anaesthetic, again I have met it present in one eye, absent in the other. The plan of touching the globe of the eye with the finger is not to be commended, rather raise the upper eyelid with the thumb and gently blow on the eye, doing this at certain intervals, as any repetition soon nullifies the test. With regard to the pupil the same information cannot be gained as in adults, for violent struggling efforts, or impending vomiting as well as the dreaded cardiac syncope is ushered in with dilatation of pupil; again it is frequently noticed that the child's pupils may be widely dilated at the commencement of the administrarion and may only contract the merest degree throughout the operation, even though the deepest degree of narcosis is present.

Skin reflexes are very persistent and in several cases I have noticed the cremasteric reflex persist throughout the operation, and in two cases referred to later an priapism was present all through the administration. It is a well-known fact that children are extremely susceptible to shock and the great object of the anaesthetist in children is to secure such a state of anaesthesia that any risk of such exigency must be quite eliminated, hence arises the critical question, "Is the patient ready"? and before making a reply one should take into consideration the different symptoms which should guide you in saying yes or no, there is no single sign any use, all must be considered, thus the state of the pupil, in conjunction with relaxation of the extremities, pinching the skin, flaccidity of the masseters , evenness of the respiration. In all the cases I have used either a towel or Skinner's mask (with a quarter removed) the former in preference because you can secure the lower jaw, hold it well forward and at the same time watch the lips and respiration. The lips I carefully watch throughout and if they display any pallor I remove the towel immediately; on several occasions have I noticed the lips become quite pallid and the breathing has been quite regular, at once I have removed the Anaesthetic and a little while

later breathing has become irregular, showing patient has reached the dangerous zone and if the "lip-signal" had not been duly recognised and properly interpreted the respiratory difficulty might have been of a most serious nature from the circulation of the vapour in the system.

The part of the administration which I think is always the critical and anxious one is when a nervous child struggles violently, strains, swallows, coughs, cries or holds its breath, then gives one or two deep inspirations, if the vapour is concentrated it will be quite sufficient generally to anaesthetise the child, so it ought always to be withdrawn at this stage, if it is not under after the lapse of some seconds and shows signs of returning consciousness it is an easy matter to exhibit more, but if one continued it is easily understood what the result might be by adding to blood already over-loaded with a drug which is now poisonous. Once under a very little is necessary for the remainder of the operation.

If your patient is to be anaesthetised for an emergency operation and the stomach is full, it is best to cease the administration and allow the stomach to be emptied of its contents, better do this at the first inhalation and then there is no fear of any food

regurgitating into the trachea; and what is more it prevents or rather often saves long and tedious sickness and depression afterwards, a lot of anaesthetists push the Chloroform when vomiting threatens, but as in adults for the above reasons, I prefer rather to let them partially out and vomit.

It is very largely believed that children are extremely susceptible to shock and formerly the object of the anaesthetist was to secure a profound degree of anaesthesia before he allowed the surgeon to use his knife. Certainly in all my earlier cases I was more punctilious on this subject than with adults, and not until I had considered every sign of insensibility - the condition of the pupil, relaxation of limbs, pinching the skin, flaccidity of the masseters, evenness of the respiration did I give consent for the operation to begin. During the past year with the advent of Mr. R. W. Murray's appointment from Honorary Surgeon of the Liverpool Sick Childrens Infirmary to the Northern Hospital came a great increase in the number of juvenile patients and with it the character of the anaesthesia also changed. Mr. Murray is an enthusiastic believer in partial anaesthesia with chloroform for children, and his large experience at Pendlebury Childrens Infirmary as well as at Liverpool, has so convinced him that the

best results are obtained by this method that in almost all his cases he insists on only partial anaesthesia. His favourite operations of hare-lip and cleft palate are frequently interrupted by the reflex struggling of the child, he calmly stops all operative procedure for some time and allows more chloroform to be added until struggling has ceased, then the towel is removed and operation proceeds, In empyema it answers extremely well and reduces very considerably the after effects of a large evacuation of pus from the pleura. In operations about the face when blood is likely to enter the pharynx, it is a most useful method, enabling the patient by coughing to expel any foreign which might enter.

Ether. Certain specialists are loud in their praise of this anaesthetic for children, some enthusiastic etherists like Warrington Hayward say when ever an operation is indicated on a child ether should be the choice of the administrator. Perhaps my limited experience does not justify me in expressing an opinion, but certainly my experience in the nine administrations I made does not encourage me to further use it for children, or advocate its exhibition under any circumstances in a children's ward. All my administrations were made by Romboll-Birch's inhaler and the sight of the apparatus was quite sufficient to strike terror into the patient,; in all violent struggling occurred, in most of them after sickness wasa distressing condition, lasting in one case for 40 hours, the quantity necessary was too much and the anaesthesia was never so deep or so satisfactory as with the more potent drug. The subjects selected were all strong healthy male children over five years and "In patients" true none of them developed any respiratory trouble, but then they were all carefully tended in a warm ward, what the result would have been were they anaesthetised in the O.P.Room and sent out in the cold as a large number of our chloroform patients are, I fear to predict. The

sole recommendation for ether is that it is said to be practically safe.

Alcohol Chloroform and Ether. (A. C. E.)

As previously stated this an anaesthetic I do not favour very much and all administrations 29 in number have been made at the express desire of the operator. It is still used as a substitute for ether and given with a Clover, Allis, or Rombold Inhaler it might act as such, but as I always gave it by the open method, I could only regard it as a diluted chloroform mixture.

My experience was that it increased the period of excitement, took a longer time to produce the necessary degree of narcosis, and a greater quantity of the mixture was used than there would be with chloroform. The after results were very similar to C H Cl_3 . If A. C. E. is to be used as a substitute for ether then I think it should be administered in a similar manner, and for children I think Junker's inhaler would be the most convenient as recommended by Buxton.

If an inhaler is adopted the face-piece should be frequently removed, because after all, the active element present is chloroform, and a proper dilution with air is just as essential here as with chloroform by the open method. Its special value is supposed to be in

in great cardiac enfeeblement, when the ether exerts its stimulating effect; but I have derived equally good, if not superior, advantages with C H Cl_3 preceded by a hypodemic injection of ether and strychnine.

Nitrous Oxide.

For minor operations, such as making incisions, extracting teeth, this anaesthetic is always a ready and convenient medium. In the out-patient room where no special preparation of the patient is possible, it can be given after a meal and the child rapidly regains its normal state and is able to leave without any loss of time. All of my administrations were with the Romboll-Birch excluding air, and in sitting postures; the period of anaesthesia never exceeded 80 seconds.

The use of Morphia with Anaesthetics.

1. In many cases patients come into hospital suffering such acute pain and toss about in every possible manner to obtain relief, then a hypodermic of morphia either $\frac{1}{4}$ or $\frac{1}{6}$ of a grain is given immediately, and in a few hours this is repeated if necessary, no regard is ever paid to the coming anaesthetic be it $CHCl_3$ or ether In all our cerebral cases morphia is given about 30 minutes before operation, following Professor Victor Horsley's suggestion that it diminishes the vascularity of the brain and its meninges. ((B. M. J) Vol. II 1886. p. 670.)

The same treatment is adopted in operations on the thyroid.

If the patient is old, feeble, very exhausted, and troubled with cough, Atropine I. II. or III m is combined with the morphia.

In 133 Chloroform administrations Morphia $\frac{1}{6}$ or $\frac{1}{4}$ was given within an hour of operation, and in 58 Atropine and morphia was given. 191 cases altogether.

In 108 ether administrations, similar quantities of morphia were administered, and in 73 cases Atropine and morphia was given. Total 181.

In 11 cases of gas & ether morphia was given before.

Only in one case of ether and oxygen was morphia and atropine given.

II.

So before	Chloroform.	191
	Ether	181
	Gas and Ether	11
	Ether and Oxygen	1
		394

None of the patients were under 7 years, but every age over that to 75 years.

From references to the above cases I am strongly convinced that morphia is an excellent adjunct to general Anaesthia.

(1) No one can overestimate the relief of pain to the patient suffering from some severe accident while awaiting operation, again the benefits of procuring a "period of rest" is invaluable to patients when a compound comminuted fracture exists and a good result is desired.

(2) With $C.H.Cl_3$ he takes a less quantity, this is well seen if operation is prolonged. I cannot say I have noticed much difference with ether, even in prolonged operations.

(3) The period of excitement is lessened both in

time and degree.

(4) When atropine and morphia combined is given, the patients were always very exhausted and in all these cases the patient afterwards took the anaesthetic well.

III.

(5) In certain cases of morbus cordis atropine was combined with the idea of lessening the reflex inhibition of the heart, and for its action on the peripheral termination of the pneumogastric nerve. Certainly in all such cases the administration was attended with the best possible results.

(6) As regards after symptoms I think it may conduce to a brief sleep after operation is over, but otherwise I think it has little influence on the after result. Vomiting has occurred in many of the cases but it must be remembered that the patients had not the advantage of any special preparation. I think the opiate has little influence, because as a rule it is too small to be appreciable after a few hours.

IV.

Post anaesthetic administration of morphia $\frac{1}{6}$ or $\frac{1}{4}$ gr. should never be given until the patient is quite conscious. After giving ether I always use the combination of atropine and morphia, this helps to lessen the secretion of saliva and mucus. Some form of opiate is given always to patients where any pain is likely to be experienced, to children in the form of nepenthe or Dover's powder, to adults as Tincture Opii. Morphia suppositories or hypodermic injections and nearly always within the hour. No ill effects have been noticed nor any collapse observed, in short we have at all times followed this routine treatment with most beneficial results.

V.

Before operation patient is auscultated and if young robust male and complaining of much pain morphia gr.$\frac{1}{4}$ is given half an hour or so before administration, if female and inclined to be neurotic $\frac{1}{6}$ is the usual dose, and if patient is debilitated or weakened by shock or disease atropine is always added and in such cases never more than $\frac{1}{6}$ of morphia is given. If the anaesthetist is aware of the amount of opiate received by the patient he need be apprehensive of no danger, and I fear the disrepute into which morphia has fallen

is that - as in a case of my own - the patient has been plied with opium for days before he comes into the hands of the anaesthetist, and he is treated as if he had not received any. Such cases require more than ordinary caution, this is specially true of C H Cl$_3$ where patients usually fall under its influence and here too, the pupils being contracted also tend to take one off their guard.

ANAESTHETIC MIXTURES.

Ether followed by Chloroform.

This combination of anaesthetics is one which is finding great favour in English Hospitals, and in one - The London Hospital - it has quite supplanted all the other combinations. In my table of anaesthetics on page 3 it will be seen to be fourth on the list, though I must confess that in my earlier days of anaesthetics my failures in administering ether drove me to seek certain anaesthesia in chloroform hence the large number of administrations under this head.

The administrations of ether were always precisely the same as that described on page with the Romboll-Birch Gas and Ether Apparatus and etherisation was continued until patient was fully under, then the apparatus was removed, lips briskly rubbed with a towel and the chloroform was then exhibited, in small quantities at first and gradually increased according to the requirements of the case. The success or failure of your anaesthetisation with ether and chloroform depends on the time you remove your ether, and the manner you exhibit your chloroform; in a word, you produce anaesthesia with ether; you maintain it with chloroform. Great caution must be exercised in commencing chloroform inhalation, because here we have a patient deeply under the influence of ether; his circulation

is rapid; his respirations are increased; shallow at first when the full force is removed, but with a few inhalations of pure air they quickly become deep and full; so that an over-dose of chloroform may readily be taken.

The advantages of this method are:-

(1) The stage of struggling, coughing, holding the breath is passed under the influence of ether; in this stage death is practically unknown with ether, while death from chloroform frequently occurs during this stage.

(2) Considerably reduces the risk of respiratory trouble to the patient afterwards.

(3) Heart is stimulated , circulation well maintained a matter of great importance in prolonged operations involving considerable hemorrhage.

(4) A small quantity of ether is all that is necessary to anaesthetise the patient and similarly very much less chloroform is required than if chloroform had been used from the out-set.

(5) It might be supposed that patients would suffer from the disagreeable after effects of both drugs,but experiences teaches that the contrary is the rule, and patients who have been prostrated after ether or chloroform have suffered no inconvenience after the

combination of those drugs, the diminished quantity used no doubt being responsible for the fortunate result.

Against these advantages must be placed the fact that some risk is incurred in changing from ether to chloroform, and ought not to be undertaken unless the anaesthetist is quite conversant with the administration of both ether and chloroform.

I have administered this sequence of anaesthetics to 71 patients - 53 males, 18 females - ages varying from 16 years to 62 years, for operations lasting from 12 minutes to two hours and a quarter.

Of the 53 male subjects the majority belonged to the type of patient characterised by obesity, having the stout thick neck so commonly associated with that condition, and from whom a history of alcoholism could be elicited. Add to this the morbid anxiety and causeless dread to which many of this class of patients are a prey when the hour of operation draws near, and we get the very subjects one could safely predict struggling during the initial stages of the administration.

For such people ether followed by chloroform is especially adapted, because here you get through the struggling stage with the safer anaesthetic and can

immediately dispense with it, thus saving the after effects of ether, the most troublesome of which in alcoholics is a wild noisy delirium, and less chloroform is required to maintain a satisfactory degree of anaesthesia.

For a small number of the cases chloroform was thought to be contra-indicated so ether was selected, but as the necessary degree of narcosis could not be obtained without pushing the ether, resort was had to chloroform. In such cases the ultimate result is not so gratifying unless at the out-set it is decided to change the anaesthetic, because here ether is exhibited for too long a time and in too large a quantity, thus rendering further chloroformisation difficult and dangerous.

Of the 18 female patients I must include no less than 10 under the last-named class, where ether was the anaesthetic selected at first, but chloroform had eventually to be used. Two, aged 60 and 62 were operated on for strangulated herniae and the ether was used as a perparatory stimulant only, the conjunctival reflex, not being abolished in either case before chloroform was commenced; from the anaesthetist point of view both administrations were a success, though neither patient ultimately survived the operation. Five

patients whose ages varied from 40 to 54 belonged to the type described on page 128, while one, the youngest patient of the lot, viz. 16 years, was a poor anaemic girl with a cleft palate, and in her case chloroform was administered through Junker's inhaler for the convenience of the operator and gave every satisfaction.

The After Effects, hardly call for any special mention any marked gastric disturbance, unless present before operation, was conspicuous by its absence, likewise the terrible prostration occasionally seen after both ether or chloroform. The wild shouting and noisy excitement of the alcoholic men or the hysterical manifestations of highly-strung women, so common with ether was never present during the stage of returning consciousness after ether & chloroform.

A C E is an anaesthetic mixture which is used as an alternative for ether or chloroform according to the predilection of the anaesthetist. It is thought that the addition of ether neutralises the depressant effect of chloroform and the alcohol acts as a stimulant. The mixture of Martindale is much praised and some writers go so far as to say, that the mixture will remain stable. The volatility of each ingredient varies, ether evaporates immediately, the chloroform next and lastly the alcohol.

A C E is always administered on a Skinners mark and consequently there is a great deal of evaporation of the mixture. In a number of English hospitals it is given with a Clover's Ether Inhaler, Allis', Junkers, or Rendle's inhaler, and by this means unconsciousness is more readily secured. In all my cases the patients belonged to that type who demanded as much air as was compatible with anaesthesia. At King's College, London, this is the routine anaesthetic and there it is given to patients of every age. (Hewitt's Anaesthetics and their Administration)

The special cases where I have used this mixture with success will be found under the different diseases.

My own experience is, that it is the ideal

anaesthetic to employ when dealing with an elderly patient suffering from bronchitis, advanced emplysema, and dilatation of the heart.

Chloroform followed by ether.

This combination of anaesthetics was recommended by the late Professor Rutherford in cases where from the length of time, or excessive hemorrhage, or severity of operation the patient collapsed. It was a method adopted to a slight extent in the Gynaecological wards of the Royal Infirmary at Edinburgh.

The ether however is then always administered by the "open method."

When a change is made here from chloroform to ether the latter is always given with the Rumboll-Birch Ether inhaler.

If this method is adopted to save a patient the disagreeable sensations of the initial stages of etherisation then chloroform is only used to blunt sensibility; usually however ether is exhibited to give a collapsing patient a fillip until the termination of a prolonged operation.

The advantages of the method are:-

(1) Patient is rendered unconscious with chloroform which is not irritating to the larynx and is also saved the feeling of suffocation which the face piece of an ether inhaler causes.

A nervous patient suffers less mental anxiety when a simple towel is produced than when an

elaborate inhaler is exhibited.

The change from chloroform to ether may be affected at any time during the administration but some judgement is required to know the exact quantity of ether to commence with; as a general rule I always commence with the indicator of the ether apparatus turned to .1". and increase or decrease as occasion requires.

This is a combination which has not given the most satisfactory results in my hands and I was always very loth to change from chloroform to ether even towards the end of a long operation.

If the mixture is used with the idea of greater safety I do not think it can be commended as in the large majority of chloroform fatalities death occurs within the first few minutes of administration.

Nitrous Oxide, Ether and Chloroform in succession were given to 7 patients and in all with complete success, though the combination of anasthetics was at first really forced upon me by failure with gas and ether. I found it acted so admirably that I think it is a method which deserves a wider trial.

The advantages claimed for this method are:-

(1) With nitrous oxide we have a rapid, pleasant, safe method of producing unconsciousness.

(2) This unconsciousness is intensified and maintained with ether, and by so doing the patient is saved the disagreeable initial sensations caused by this anasthetic, and more than all his heart receives a fillip and the whole condition of his circulation improves.

(3) Then the chloroform being exhibited any degree of anasthesia may be maintained at the will of the operator and thus any risk of pulmonary mischief afterwards is reduced to a minimum, and as with ether and chloroform once the patient is under ether, little chloroform is required to maintain anasthesia.

At first sight this combination looks elaborate and unnecessary, but in a hospital, with a gas and ether inhaler at hand no trouble is entailed and when

discontinued the chloroform can readily be applied.

I have always used it in abdominal cases where a rapid anasthesia is essential without causing any risk of struggling, vomiting or cardiac depression, in short this triple combination answers admirably in such cases where both ether and chloroform are indicated, but there are reasons for not employing either anasthetic exclusively throughout the operation.

Oxygen and Ether.

In some of the very critical cases, where patients are almost dead from shock the combination of oxygen with ether has produced the most beneficial results.

The method employed is similar to that described under gas and ether. page 22.

The Rumboll Birch inhaler enables one to give as much oxygen as the condition of the patient requires, and at the same time administer ether.

Under the chapter of "Shock" an illustrative case is cited to shew its value.

The advantages experienced anasthetists claim for this mixture are, that it reduces risk of dangerous collapse in certain cases, less liability to vomiting afterwards, secures a good colour for patient throughout the administration.

Nitrous oxide gas is exceedingly useful for minor surgical operations and practically safe. Its large use is of course in dental practice where the patient comes to hospital, is anaesthetised in sitting position and after the operation is at once able to return without any of the nauseating sensations experienced with ether or chloroform. Its disadvantage is the limited period of anaesthesia attained, rarely can a longer interval than 90 seconds, usually 60, be relied upon, however for opening abcesses, removing tonsils, or aspirating a bladder this is quite sufficient.

It can be given to patients at all ages and any disagreeable after effects are very exceptional.

L O C A L A N A E S T H E S I A.

In the outpatient department and for minor operations in the wards it is the custom to use Ethyl Chloride Spray or Cocaine, the former is a convenient way to blunt sensibility to pain during the actual cutting, but it renders the skin so tense and the subsequent operation of thawing in all cases so painful that it is not satisfactory and I prefer cocaine. Altogether I have used cocaine in 63 cases and the method of administration has been either by painting with solutions of different percentages varying from 5% to 20%, by hypodermic injections employing solutions of the hydrochlorate varying from 5% to 15%, usually a 10% is used. The latter method is the one usually adopted and is used in the following way:-

The skin over the part to be operated on is rendered as aseptic as possible by cleansing with water application of carbolic 1.40, or hydrarg perchlor 1 - 2,000. In the hypodermic syringe you take mVI of the hydrochlorate of cocaine, and gently insert the needle into the part to be anaesthetised for a length of 1 to 1½ inches, then inject 2 minims of the solution and withdraw the needle about a quarter of an inch and inject 2 more minims, nextly the needle is almost withdrawn and the remaining 2 minims is injected, the whole

process usually occupies about two minutes and in five minutes more the patient is ready for the operation.

Painting the tonsil with a 20% solution of the hydrochlorate of cocaine prior to tonsillotomy was not a success, the patient feeling the operation rather keenly and the unpleasant sensations of the drug afterwards.

I append a tabulated statement of the various operations in which cocaine was used:-

Incision of Carbuncles	13
Removal of Sebaceous Cysts	10
Amputation of phalanges	9
Excision of Tonsils	8
Excision of Varicose Veins	6
Removal of Nasal and Aural polypi	4
Removal of Hemorrhoids	3
Empyema	3
Removal of Great Toe Nail	3
Tying the Radial artery at the wrist	2
Removal of Uvula	1
Extravasation of Urine, External Urethrotomy	1
	63

Males 48. Females 15.

None of the patients were under 16 years, one was aged 62 - average age 28 years.

The most successful operations were for Excision of Varicose veins, all the patients belong to that stolid, strong willed resigned type which augurs well for a good anaesthetisation. The skin over the varicose portions to be excised was marked with a dermatograph, the limb then rendered bloodless by an Esmarch's bandage and a tourniquet applied high up after the method suggested by Dr. Corning of New York. (Treeves' System of Surgery, Vol.I p.291) An incision 2" long was made in the middle of the thigh, the long saphenous vein was secured and ligatured above and below the varicosity excised, and the wound stitched up again. Time occupied 16 minutes. Patient said he felt the last stitch or two slightly but nothing more.

In a very bad case of extravasation of urine a 5% solution was injected as described above into the perineum and incision made to relieve tension. The patient had all his ribs broken on one side and a dilated fatty heart, so any general anaesthetic was considered contra-indicated. He complained of pain on the insertion of the needle, but did not feel anything afterwards, and no ill effects were noted afterwards.

The after effects of cocaine seem to be so uncertain that the greatest caution should be exercised in its administration. To the nervous or debilitated gas is a preferable anaesthetic to cocaine; some people are extremely susceptible to its influence and I have seen strong young men require strong stimulation to prevent fainting after its use; in some cases this might be caused by the sight of blood during the operation. Its use in children has not found sucess. Cocaine is a useful local anaesthetic but discrimination ought to be used in its administration and any indication of circulatory failure after its use should be promptly met.

Anaesthetics considered in relation to regional surgery.

For many operations on the skull, the presence of an elaborate ether inhaler tends to hamper the movements of the surgeon; however, by standing on the left or the right side of the patient, the ether can be administered conveniently in the majority of cases. If it is a night operation and it is necessary to bring any light near the field of operation the use of ether is contra-indicated, with ordinary precautions when ether is given with a Rumboll-Birch Inhaler there is little danger.

Chloroform is undoubtedly the most convenient anaesthetic and when given by means of a Skinner's mask with the handle held at the chin as described on page 6 ; the surgeon has every access to the part to be operated upon, and no inconvenience is experienced by the anaesthetist.

If the brain and its membranes are to be operated upon, chloroform should certainly be used; it is the routine practice of this hospital to administer a hypodermic injection of morphia within half-an-hour of operation, acting on the suggestion of Professor Victor Horsley.

Face Operations practically exclude the use of ether, if not preceding, certainly during, the operation. In adults I invariably use chloroform commencing anaesthesia by sending patients unconscious in the ordinary way with towel or Skinner's mask; then I change for a Junker's inhaler and maintain anaesthesia with it throughout the operation. This method I find to answer best, nothing is gained by commencing chloroformisation with a Junker, because it is irritating and uncomfortable and involves some time in the process; however, when you have rendered patient unconscious the tube can be inserted into the nostril and a light or heavy anaesthesia secured as desired. With some subjects ether may be used in the same manner as a primary anaesthesic, and when patient is deeply under its influence to change to chloroform administered with a Junker. It is well always before inserting the tube of the Junker into the nostril to see there is a "free air way" because if the nostril is blocked little good is obtained with your chloroform.

Operations on the upper and lower jaws, tongue, floor of the mouth, tonsils, post nasal adenoids, and similar operations are apt to be attended by the anxious accident of entry of blood into the larynx, giving rise to troublesome coughing if the anaesthesia is light, and to more grave respiratory embarrassment if it be profound. To guard against such an exigency only a light anaesthesia may be employed, but this is not often convenient to the surgeon. Another plan is to keep continually clearing the back of the throat with mounted sponges. This again, however, has the disadvantage of hampering the operator.

The best method is to try and place your patient in some position which will prevent any regurgitation of blood into the larynx, in this matter you must be guided by the site and nature of the operation. One way of doing this is to fully extend patient's head over the end of the operating table, as in operation for adenoids, or if the upper jaw is, in part operated on, the lateral position is convenient and useful. In operating on children for hare-lip and cleft palate, it is usual to place them in a sitting posture on the operating table, and fully extend their heads by a pillow under the nape of the neck. When Junker is used in children the tube should not be inserted in

the nostril but held about an inch from it. William Rose in his book on "Hare Lip and Cleft Palate" pages 105 and 106., objects to the employment of Junker and advises chloroform by means of a towel.

In administering chloroform through a preliminary tracheotomy wound my experience has been limited to two cases. One was Rouge's operation for the removal of some carious bone, the other a thyrotomy. On both occasions the method suggested by Professor Annandale, described on page 10 was adopted and gave complete satisfaction.

Operations on the Thorax.

The most important is empyema and for this chloroform slowly given by means of a towel answers best. The degree of anaesthesia requisite and methods of administration have already been discussed in the chapter on the respiratory system. In all operations involving pleura or lung chloroform should be given; if patient is too ill for a general anaesthetic cocaine is admissible but the subsequent operative procedure must be very rapid.

Operations on the Abdomen.

The aim of the anaesthetist in operations on the abdomen is to secure complete relaxation of the abdominal muscles and this is best attained by the use of chloroform. The quantity of ether essential for such a degree of anaesthesia is so relatively large that there is grave risk of causing some respiratory trouble afterwards. If the patient is in a critical condition from shock as is often the case in some diseases of the alimentary tract then ether and chloroform act well. I have obtained excellent results by using Nitrous Oxide Gas, ether and chloroform in quick succession; with ether alone the results have not been so gratifying, one must remember that

often the success of an abdominal section depends on the after effects of the anaesthetic, and in employing ether one incurs considerable risk of troublesome vomiting afterwards. In three cases of "exploratory laparotomy" in which ether was exhibited I washed out the stomach with a syphon tube before giving the anaesthetic, and the vomiting afterwards was exceedingly slight, however, this is a method which cannot often be employed.

In all operations for strangulated hernia, where patient is under 50, ether is always the selected anaesthetic, and if it fails to act chloroform is then applied. Such patients are generally brought into hospital suffering from extreme collapse, as often as not they are deeply under the influence of opium and severe vomiting further complicates the administration of an anaesthetic. Ether then is given with the idea of stimulating the heart and this it undoubtedly does, but in a large number of cases early resort to chloroform was necessary. With people beyond 50 chloroform or A C E is used, but the length of time required to produce anaesthesia with the latter mixture, when we have a very collapsed patient to deal with, is a consideration which must not be overlooked.

CONCLUSION:

The subject of Anaesthetics is not one which readily lends itself for the purpose of a thesis, for when dealing with such lethal weapons as this class of drug any wide experimentation is to be deprecated. Moreover, in many cases the nature of the operation or the expressed wish of the surgeon has to be allowed a paramount importance and override all other considerations. It is to be expected that many statements will be contrary to the general teaching on the subject, for one gets not much help from text books which differ from one another and one's experience from the text books. Whatever be the anaesthetic employed, without doubt the great secret lies in an intelligent administration. There is thus no routine anaesthetic. Chloroform, Ether, A.C.E., Nitrous Oxide and the other bodies possessing analgesic properties form the anaesthetists materia medica, and the choice of the particular drug to be used in a given instance is one which must be based upon an intelligent review of all the factors entering into the case. Neither is there any routine method of administration. The aim of the anaesthetist being, as I have stated in my introduction,

to secure insensibility to pain with the minimum of risk and the maximum of comfort to both patient and operator, it would be unwise to tie one's hands in any way, and the choice must be made with an unbiassed mind. Thus in chloroform administration, in addition to the usual methods, that by means of Junker's Inhaler and by a tracheotomy tube as suggested by Annandale form valuable alternatives in suitable cases.

Thus having approached the subject with an open mind and holding no brief for any particular anaesthetic, yet the fact has forced itself upon me, that in all really critical cases where deep anaesthesia, profound muscular relaxation and minimum of discomfort or inconvenience are the desiderata, we have ultimately to fall back upon chloroform. The only great exception to this statement, the only case where ether has an indubitable advantage over chloroform is in cases of shock or traumatic anaemia. This is an aspect of the subject which I wish to bring prominently forward. In these conditions I have used both drugs, and the more experience I have, the more firmly am I convinced that here at least ether, and not chloroform, should be used. Nothing can be

more satisfactory than the action of the former in these extremely critical conditions.

Where ether has to be exhibited, there is no way of giving it which can be compared to that by means of a Rumboll-Birch inhaler, which completely overshadows all others, and no method which equals gas followed by ether can be so easily done as with this apparatus.

With regard to the degree of insensibility to be aimed at, it is hard for an old Edinburgh man to allow his patient to be touched by the surgeon until complete anaesthesia has been produced. This method of partial anaesthesia, however, has the advocacy of the 2nd Hyderabad Commission, and our experience at this hospital in the case of children has been very favourable.

Cocaine and nitrous oxide are valuable additions to our armamentarium. The latter is convenient, rapid, safe and is suitable in all classes of patients where the operation is brief, but the former requires caution in its use and a careful selection of suitable patients.

To sum up, my experience leads me to the same conclusion which Dr Waller, after a most brilliant and biassed defence of ether as an anaesthe-

tic, ultimately arrives at when he says, "As to the relative merits of chloroform and ether, if I had to take an anaesthetic myself, or my wife, or my children, I would take or recommend chloroform, but I would be unwilling that a greater percentage than two per cent should be used."*

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* Speech by Dr. Augustus Waller at Monthly Meeting of the Society of Anaesthetists, Feb. 17th 1898. "Transactions of the Society of Anaesthetists." Vol. 1; page 85 .